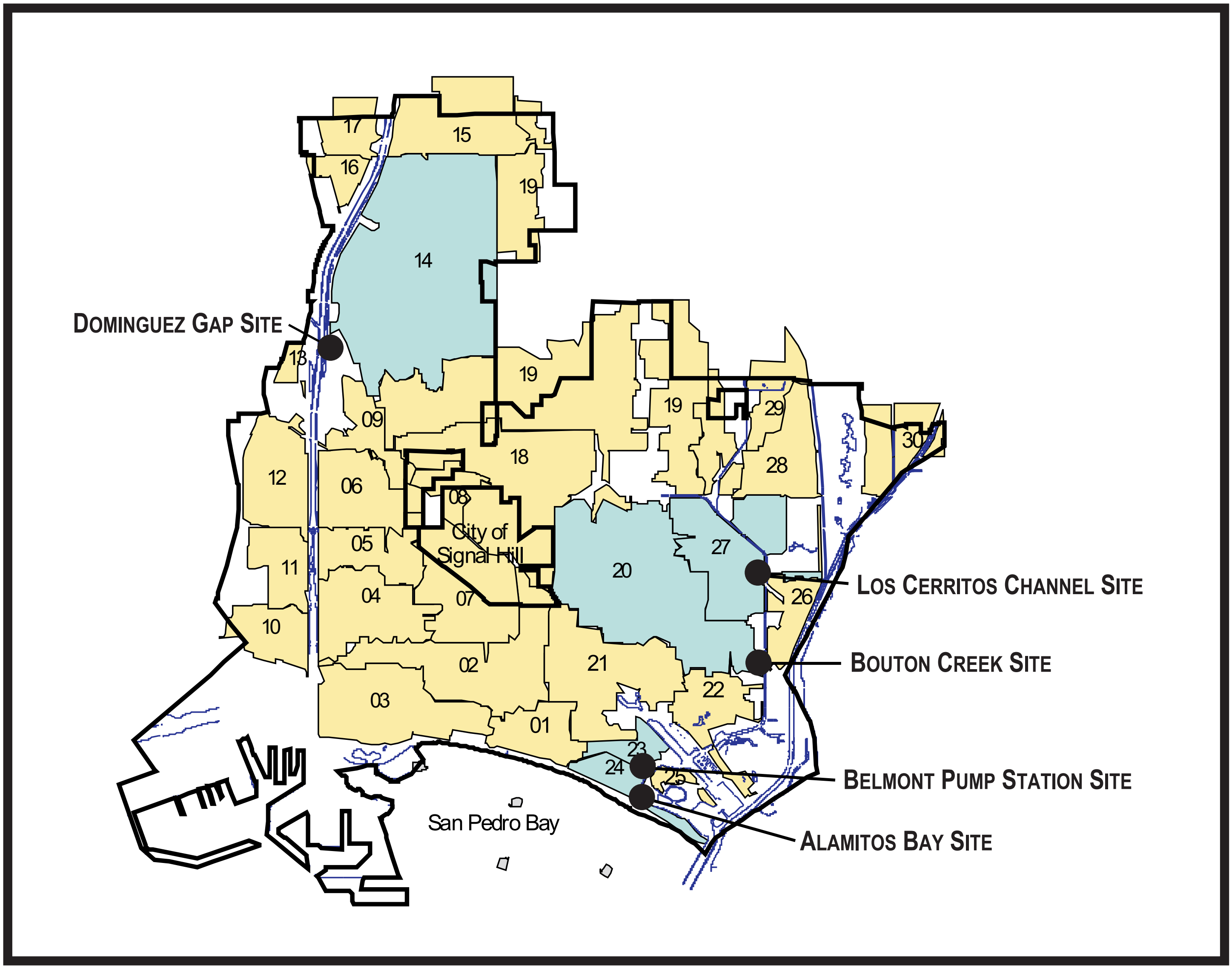
City of Long Beach
Storm Water Monitoring Report 2000-2001

NPDES Permit No. CAS004003 (CI 8052)

12 July 2001



Submitted By

City
Of
Long
Beach

Prepared By

Kinnetic Laboratories, Inc.
and
Southern California Coastal
Water Research Project

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TABLE OF CONTENTS

LIST OF FIGURES

Figure No. **Page No.**

Figure No. **Page No.**

LIST OF TABLES

Table No. **Page No.**

Table No. **Page No.**

LIST OF APPENDICES

ACRONYMNS AND ABBREVIATIONS LIST

ASTM - American Society for Testing and Materials
BHC - Benzene hexochloride
BMP - Best Management Practice
BOD- Biological Oxygen Demand
CCC – Criterion Continuous Concentration
CD - Compact Disk
CFU - Colony Forming Units
CMC – Criterion Maximum Concentration
COD - Chemical Oxygen Demand
CTR - California Toxics Rule
CV - Coefficient of Variance
2,4 D - 2,4-dichlorophenoxy
2,4 DB - (2,4-dichlorophenoxy) butanoic acid
DDD - dichloro (p-chlorophenyl)ethane
DDE - dichloro (p-chlorophenyl)ethylene
DDT - dichlorodiphenyl trichloroethane
DF - dilution factor
DI - Deionized
DL - Detection Limit (considered the same as RL)
DO - Dissolved Oxygen
EC_{50} - Concentration causing effects to 50% of the test population
EDTA - ethylene diamine triacetic acid
EMC- Event mean concentration
GIS - Geographic Information System
IC25 - Concentration causing 25% inhibition in growth or reproduction
IC50 - Concentration causing 50% inhibition in growth or reproduction
ICP-MS - Inductively Coupled Plasma-Mass Spectrometry
ID - Identifier
ID - Insufficient Data
KLASS - Kinnetic Laboratories Automated Sampling System
KLI - Kinnetic Laboratories, Inc.
LC_{50} - Bioassay concentration which produces 50% lethality
LDPE - Low Density Polyethylene
LOEC - Lowest Observed Effect Concentration
LPC - Limiting Permissible Concentration
MBAS - methylene-blue-active substances
MCPA - 2-methyl-4-chloro-phenoxy acetic acid
MCPP - 2-(4-chloro-2-methylphenoxy) propanoic acid
MPN- Most Probable Number
MS4 - Multiple Separate Storm Sewer System
MTBE- Methyl Tertiary Butyl Ether
NCDC-National Climate Data Center
NPDES –National Pollutant Discharge Elimination System
NOEC - No observed effect concentration
NTS - Not to Scale
NTU - nephlometic turbidity units
NURP- Nationwide Urban Runnoff Program
PAH - Polynuclear Aromatic Hydrocarbons

PCB - Polychlorinated bi-phenyls
PDF - Portable Document Format
ppb - Parts per Billion
Q - Flow
QA/QC - Quality Assurance/Quality Control
RBF- RBF Consultants
RMP - Regional Monitoring Program
RL- Reporting Limit (considered the same as DL)
RPD- Relative Percent Difference
SAP - Sampling and Analysis Plan
SCCWRP - Southern California Coastal Water Research Project
sf- Square Feet
SM- Standard Methods for the Examination of Water and Wastewater
SOP - Standard Operating Procedure
SRM - Standard Reference Material
STS - sodium tetradecyl sulfate
SV - Semi-Volatile Compound
2, 4, 5-TP - 2-(2,4,5-trichlorophenoxy) propanoic acid
2, 4, 5-T - 2,4,5-trichlorophenoxy
TBD - To Be Determined
TDS – Total Dissolved Solids
TIE – Toxicity Identification Evaluation
TKN- Total Kjeldahl Nitrogen
TOC - Total Organic Carbons
2, 4, 5-TP - 2-(2,4,5-trichlorophenoxy) propanoic acid
TPH - total petroleum hydrocarbons
TRPH - Total Recoverable Petroleum Hydrocarbons
TSI - ToxScan, Inc.
TSS –Total Suspended Solids
TTLC - Total Threshold Limit Concentration
TU - Toxicity Unit
TUc – Chronic Toxicity Unit
USEPA - U.S. Environmental Protection Agency
WQO - Water Quality Objective
WQS - Water Quality Standard

CITY OF LONG BEACH
STORM WATER MONITORING REPORT 2000-2001

NPDES Permit No. CAS004003 (CI 8052)

1.0 EXECUTIVE SUMMARY

1.1 Introduction and Purpose

The City of Long Beach was required to conduct a water quality monitoring program for storm water and dry weather discharges through the City's municipal separate storm sewer system (MS4) beginning in the 1999-2000 wet weather season under terms of Order No. 99-060 National Pollutant Discharge Elimination Systems Municipal Permit No. CAS004003 (CI 8052).

The monitoring program calls for monitoring mass emissions and toxicity at three representative mass emission sites during the first wet season and four sites for the second wet season. Four wet weather storm events were to be monitored annually. Monitoring of one receiving water site (Alamitos Bay) was also required for each of these four wet weather storm events. In addition, dry weather inspections and the collection and analysis of dry weather discharges were required at each of these monitoring sites over two different 24-hour periods during each dry season. Water samples collected at the monitoring sites during each time period were to be analyzed for all parameters specified in the permit and tested for toxicity. Additionally, the program called for monitoring the receiving water body site (Alamitos Bay) for bacteria and toxicity to provide water quality information during both the wet and dry seasons, and on the effectiveness of a dry-weather diversion.

Monitoring sites specified in the permit are as follows:

Basin 14: Dominguez Gap Pump Station Monitoring Site
Basin 20: Bouton Creek Monitoring Site
Basin 23: Belmont Pump Station Monitoring Site
Basin 27: Los Cerritos Channel Monitoring Site (Second Year)
Alamitos Bay Receiving Water Monitoring Site

During the first 1999-2000 wet weather season, start-up delays associated with permitting for placement of storm water monitoring equipment in the Los Angeles County Flood Control District facilities prevented the wet weather monitoring from being carried out. Instead, a special research study on Parking Lot Runoff was carried out with the permission of the Regional Water Quality Control Board staff. In addition, the required dry weather monitoring was carried out for this first year. A previous report (Kinnetic Laboratories, Inc., 2000) covered the first season dry-weather monitoring events performed in June of 2000 as well as one additional receiving water sampling in April 2000. The results of the Parking Lot Runoff Study are documented in a Southern California Coastal Water Research Project report (Tiefenthaler et al., 2001) attached to this annual monitoring report as Appendix F.

The purpose of this present report is to submit the results of the City of Long Beach's storm water monitoring program for the second year, 2000-2001. Kinnetic Laboratories, Inc. conducted this monitoring program as Prime Contractor to the City of Long Beach. Toxicity studies were carried out by the Southern California Coastal Water Research Project (SCCWRP) as a subcontractor to Kinnetic Laboratories. Chemical analyses and some of the toxicity testing (fresh water tests) were carried out by ToxScan, Inc. supplemented by other participating laboratories as necessary.

1.2 Summary of Results

After permits were received, wet weather sampling of storm events began in January 2001. During this wet weather season, the targeted number of four storm events were monitored at all of the City of Long Beach's mass emission stations, with the exception of the Dominguez Gap Pump Station where only three overflow discharge events occurred. A fifth event was monitored at Los Cerritos Channel as one of the first four events had low storm capture for the composite sample obtained during that event. Four receiving water events were also monitored in Alamitos Bay associated with the above storm events.

Two dry weather inspections/monitoring events were obtained last summer during June 2000 for three mass emission sites, Dominguez Gap, Bouton Creek and Belmont Pump, as well as for Alamitos Bay. One similar dry weather event was carried out this year during June 2001 for four mass emission sites (Los Cerritos added this year) and for the Alamitos Bay receiving water site. These results are reported herein. A second dry weather event will be carried out at all of these sites later this summer and the results reported in an addendum to this report.

The results of the City of Long Beach's storm water monitoring program may be briefly summarized as follows based upon the limited number of monitored events available at this time for the program:

<u>Chemical and Bacterial Results</u>

- A preliminary comparison of combined data from all Long Beach mass emission sites with data from Los Angeles County shows that Mean Event Concentrations (EMCs) for most constituents are generally similar.

- Numerical water quality standards do not exist for storm water. Receiving water quality criteria can provide a reference point for assessing the importance of various storm water contaminants, though other factors such as dilution and transformation in the receiving waters, beneficial uses, and habitat types must also be considered.

- The mean EMCs for three of the total metals in storm water discharges from the City of Long Beach exceeded 1997 Ocean Plan daily maximum criteria (Pb, Cu, and Zn). Mean EMCs for dissolved Cu exceeded freshwater and salt water California Toxics Rule (CTR) criteria, and the mean EMCs for dissolved Zn exceeded the freshwater CTR criteria.

- Concentrations of bacteria (Total Coliforms, Fecal Coliforms, and Fecal Streptococcus) were high in the Long Beach storm water discharges as is common for all urban runoff. Mean concentrations of bacteria were 143,000 mpn/100 ml for total coliform, 45,000 mpn/100 ml for fecal coliform, and 15,000 mpn/100 ml for fecal streptococcus. These values are lower than similar mean values in the Los Angeles County data set, but these differences may be due to our presently limited number of data points for Long Beach.

- For the Alamitos Bay receiving water, samples from this study and from the City of Long Beach Department of Health and Human Services monitoring data were compared with historical rainfall records from the Long Beach Airport. Microbiological data from the

City's storm water program demonstrate relatively low levels of total coliform, fecal coliform, and fecal streptococcus during all dry weather periods. Tests conducted during wet weather periods resulted in levels of each bacterial component that were one to two orders of magnitude higher than during summer dry weather periods. Based upon all available data, it is not apparent that the dry weather interceptor in Basin 24 has had any discernable impact on the bacterial concentrations in Alamitos Bay during the extended dry weather during the summer of 2000.

- Runoff collected from open channels in Bouton Creek and Los Cerritos Channel had the highest levels of suspended solids. Total recoverable trace metals were typically highest in discharges collected from Los Cerritos Channel where total suspended solids were consistently the highest (170-350 mg/l). The Belmont Pump station had the highest levels of total and dissolved Cu and higher levels of dissolved Zn. Preliminary data also indicate that the Dominguez Gap site was less enhanced with Cu, Pb, and Zn when compared to the other sites. The Dominguez Gap Pump Station has a large detention/infiltration basin just before the pump station that discharges overflow into the Los Angeles River.

- Dissolved Zn was notably higher in the discharges from the Belmont Pump station, and dissolved Zn was also relatively high at both Bouton Creek and Los Cerritos Channel during late season events.

- Organic compounds were generally below detection limits in Long Beach storm water discharges. However, limited numbers of occurrences of the pre-emergent herbicide diuron and six other herbicides were measured. The herbicide glyphosate (Trade Name - Round-up®) was detected during the April 7th event in water from the Los Cerritos Channel at moderately high levels (94 ug/l) indicating recent applications to control weed growth in that watershed. Three occurrences of both alpha and beta BHC were observed as were occurrences of organophosphate pesticides (diazinon, malathion, and simazine).

<u>Toxicity Results</u>

- The relative toxicity of each discharge sample was evaluated using three chronic test methods: the water flea (*Ceriodaphnia dubia*) reproduction and survival test (freshwater), the purple sea urchin (*Strongylocentrotus purpuratus*) fertilization test (marine), and the mysid (*Americamysis bahia*) growth and survival test (marine). Each of the methods is recommended by the USEPA for the measurement of effluent and receiving water toxicity. Samples of marine receiving water from Alamitos Bay were tested with the two marine species only. Water samples were diluted with laboratory water to produce a concentration series using procedures specific to each test method.

- The frequency and magnitude of storm water toxicity from the Long Beach sites was similar to toxicity observed in samples from other Southern California watersheds.

- Toxicity characteristics of the wet weather discharges varied among sites. All five samples from the Los Cerritos Channel site caused toxicity to at least two of the species. The Belmont Pump Station had a similar pattern, with three of the four samples being toxic to multiple species. While all four samples from Bouton Creek were toxic, only one species was affected on two occasions. The Dominguez Gap Pump Station was toxic on only two of the three events, and in both cases only toxic to the sea urchin test. These differences in patterns for the sites indicate that the constituents causing the toxicity are likely to be different, especially between the Dominguez Gap site and the other three sites.

- The frequency and magnitude of toxicity was similar between the Cerritos Channel and Belmont Pump Station sites. The two most toxic samples in the study were the Belmont Pump Station sample collected April 7, 2001 and the Cerritos Channel sample from April 21, 2001. Both of these samples caused toxic effects to all three species, indicating that either very high concentrations of a toxicant are present or that toxicity may be caused by more than one class of toxicant (e.g. metals and organics).

- No significant toxicity was present in any of the Alamitos Bay receiving water samples. These results are consistent with three dry weather samples collected from the same site in 2000. Salinity measurements indicated that the wet weather receiving water samples contained about 10 % fresh water. The lack of toxicity in the Alamitos Bay samples is consistent with the results of the wet weather discharge samples, which usually had NOEC values greater than 10%.

- A large variation in the amount of toxicity was observed between storms at any given runoff site. Antecedent dry period and total rainfall and intensity may be factors, though more data will be needed to support statistical analysis. Differences in sensitivities amongst the species used were observed during the study. In general, this pattern of sea urchin> water flea> mysid sensitivity was observed, similar to previous results with last year's dry weather samples, and similar to results for other municipalities. This sensitivity would vary, however, depending upon the specific toxic constituent present in the discharge.

- TIE investigations on selected stormwater samples and the water quality chemistry results showed that trace metals, primarily zinc, was the principal cause of toxicity to sea urchins. There is evidence that other unidentified toxicants are also present in the samples. These other toxicants may include organic compounds.

2.0 INTRODUCTION

The City of Long Beach received an NPDES Permit issued by the California Regional Water Quality Control Board, Los Angeles Region on 30 June 1999 (Order No 99-060, NPDES No. CAS004003, (CI 8052)). This order defines Waste Discharge Requirements for Municipal Storm Water and Urban Runoff discharges within the City of Long Beach. Specifically, the permit regulates discharges of storm water and urban runoff from municipal separate storm sewer systems (MS4s), also called storm drain systems, into receiving waters of the Los Angeles Basin.

The City of Long Beach serves a population of about 426,000 people in an area of approximately 50 square miles. The discharges from the MS4 system consist of surface runoff (non-storm water and storm water) from various land uses in the hydrologic drainage basins within the City. Approximately 44% of the land area discharges to the Los Angeles River, 7% to the San Gabriel River, and the remaining 49% drains directly to Long Beach Harbor and San Pedro Bay. The quality and quantity of these discharges vary considerably and are affected by the hydrology, geology, and land use characteristics of the watersheds; seasonal weather patterns; and frequency and duration of storm events. Impairments or threatened impairments of beneficial uses of water bodies in Long Beach include Alamitos Bay, Los Angeles River, El Dorado Lake, Los Angeles River Reach 1 and Reach 2, San Gabriel River Estuary, San Gabriel River Reach 1, Colorado Lagoon, and Los Cerritos Channel. These areas also include coastal shorelines, including Alamitos Bay Beaches, Belmont shore Beach, Bluff Park Beach, and Long Beach Shore.

The NPDES permit requires the City of Long Beach to prepare, maintain, and update if necessary a monitoring plan. The specified monitoring plan requires the City to monitor three (Year 1) and four (Year 2) discharge sites draining representative urban watersheds (mass emission sites) during the first two years of the monitoring program. Flow, chemical analysis of water quality, and toxicity are to be monitored at each of these sites for four representative storm events each year. During the dry season, inspections and monitoring of these same discharge sites are to be carried out, with the same water quality characterization and toxicity tests to be run. In addition, one receiving water body (Alamitos Bay) is to be monitored for bacteria and toxicity during both the wet and the dry seasons and the effect of a dry weather diversion documented. In years three through five of the permit period, the City is to continue monitoring mass emission stations, and to participate in a “fair share” study of receiving waters in the Los Angeles river and San Gabriel River watersheds.

The purpose of this present report is to submit the results of the City of Long Beach’s storm water monitoring program for the second year, 2000-2001.

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3.0 STUDY AREA DESCRIPTION

The four sites for mass emissions monitoring were selected by the City of Long Beach with the assistance of the Southern California Coastal Water Research Project (SCCWRP), with input from the environmental community, and with the approval of the Regional Water Quality Control Board. These sites were then specified in the NPDES permit after an analysis of the drainage basins and receiving waters. They were selected to be representative of the storm water discharges from the City's storm drain system, as well as to be practical sites to carry out storm water and dry weather monitoring. For the first time, storm drainage waters specifically from within the City of Long Beach were to be sampled and analyzed for water quality. In addition, one receiving water site (Alamitos Bay) was also selected.

3.1 Regional Setting

3.1.1 Geography

The City of Long Beach is located in the center and southern part of the Los Angeles Basin (Figure 3.1) and is part of the highly urbanized Los Angeles region. In addition to residential and other uses, the City also encompasses heavy industrial and commercial areas and includes a major port facility, one of the largest in the United States. The City's waterfront is protected from the open Pacific Ocean by the extensive rock dikes encircling the outer harbor area of the Port of Los Angeles/Port of Long Beach complex. The waterfront includes port facilities along with a downtown commercial/residential area that includes small boat marinas, recreational areas, and convention facilities. Topography within the City boundaries can be generally characterized as low relief, with Signal Hill being the most prominent topographic feature (Figure 3.2).

3.1.2 Major Watersheds

Major water bodies receiving storm water discharges from the City of Long Beach include the Los Angeles River located near the western boundary of the City, the San Gabriel River located near the eastern boundary, and the outer Harbor of the Los Angeles/Long Beach area. The City of Long Beach has fifteen pump stations that discharge into the Los Angeles River, and one pump station that discharges into the San Gabriel River. Receiving water sub-areas of importance include the extensive Alamitos Bay, heavily developed for marina and recreational uses, and the inner harbor areas of the City, heavily developed as port facilities. Other receiving water sub-areas include the Los Angeles River, El Dorado Lake, Los Angeles River Reach 1 and Reach 2, San Gabriel River Estuary, San Gabriel River Reach 1, Colorado Lagoon, and Los Cerritos Channel. These areas also include coastal shorelines, including Alamitos Bay Beaches, Belmont shore Beach, Bluff Park Beach, and Long Beach Shore. The drainage from the City is characterized by major creeks or storm channels, usually diked and/or concrete lined such as the Los Cerritos Channel that originates in Long Beach, flows near the eastern City boundary, and discharges into the Marine Stadium and then into Alamitos Bay. Other such regional drains include Coyote Creek, which passes through a small portion of Long Beach before it discharges to the San Gabriel River; Heather Channel and Los Cerritos Line E that both enter Long Beach from the City of Lakewood and discharge into the Los Cerritos Channel; and the Artesia-Norwalk Drain that enters Long Beach from Hawaiian Gardens and discharges into Coyote Creek.

The City of Long Beach, including the City of Signal Hill, is divided into 30 watersheds as shown in Figure 3.3. Data presently in the City of Long Beach GIS database on total areas and specific land use categories for each basin are given in Table 3.1 (City of Long Beach 2001). Specific watersheds selected by the City of Long Beach for this present storm water monitoring program are described in more detail in the following section.

3.1.3 Annual Rainfall and Climate

The City of Long Beach is located in the semi-arid Southern California coastal area and receives significant rainfall on a seasonal basis. The rain season generally extends from October through April, with the heavier rains more likely in the months of November through March (see Figure 5.1 for average rainfall by month and seasonal total rainfall as measured at the Long Beach Airport). Total average annual rainfall at the Long Beach Airport is 12 inches per year.

The City lies in the Los Angeles Plain, which is south of the Santa Monica and San Gabriel Mountains and west of the San Jose and the Puente Hills. The Los Angeles River is the largest stream on the Plain and it drains the San Fernando Valley and much of the San Gabriel Mountains. Most of the streams are dry during the summer and there are no lakes or ponds, other than temporary ponding behind dunes (Miles & Goudy, 1998). The climate is mild, with a 30-year average temperature of 23.4 °C (74.1°F) at the Long Beach Daugherty Airport (NCDC, 2000).

3.1.4 Population and Land Use Characteristics

The population of the City of Long Beach totaled 461,522 residents during the year 2000 (U.S. Census Bureau, 2000). The total population of the County of Los Angeles, in which it resides, was 9,519,338. The independent city of Signal Hill, located on a promontory, is completely surrounded by the City of Long Beach. Signal Hill's population numbered 9,333 in the year 2000 and it contributes runoff to drainage basins 6, 7, 8, 9 and 18.

The City of Long Beach has a total area of 26,616 acres. Of that total 16,926 acres (64%) are classified as residential, 4,784 acres (18%) as commercial, 2,269 acres (8.5%) as industrial, 1,846 (7%) as institutional, and 786 acres (3%) as open space (City of Long Beach, 1999). The drainage basins sampled for the storm water monitoring study follow this general pattern of land use.

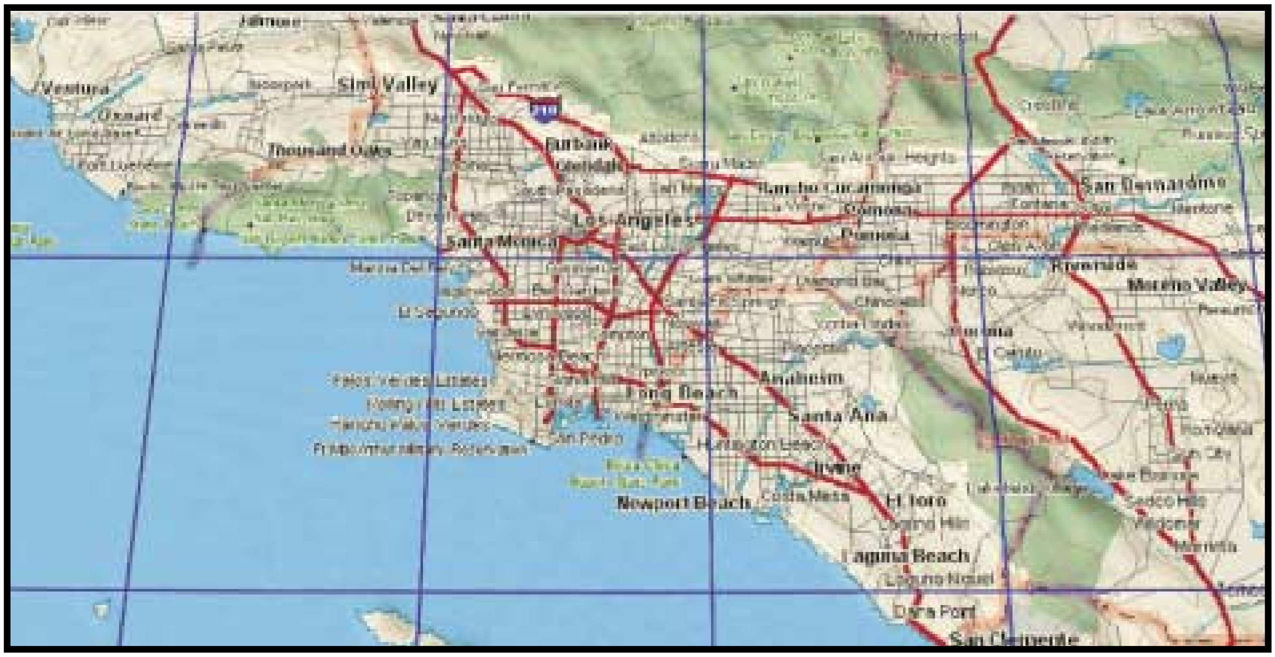

Figure 3.1. Los Angeles Basin. (Source 3-D TopoQuads Copyright 1999 DeLorme Yarmouth, ME 04096).

Figure 3.2. City of Long Beach. (Source 3-D TopoQuads Copyright 1999 DeLorme Yarmouth, ME 04096).

Major Drainage Basins and Monitoring Sites

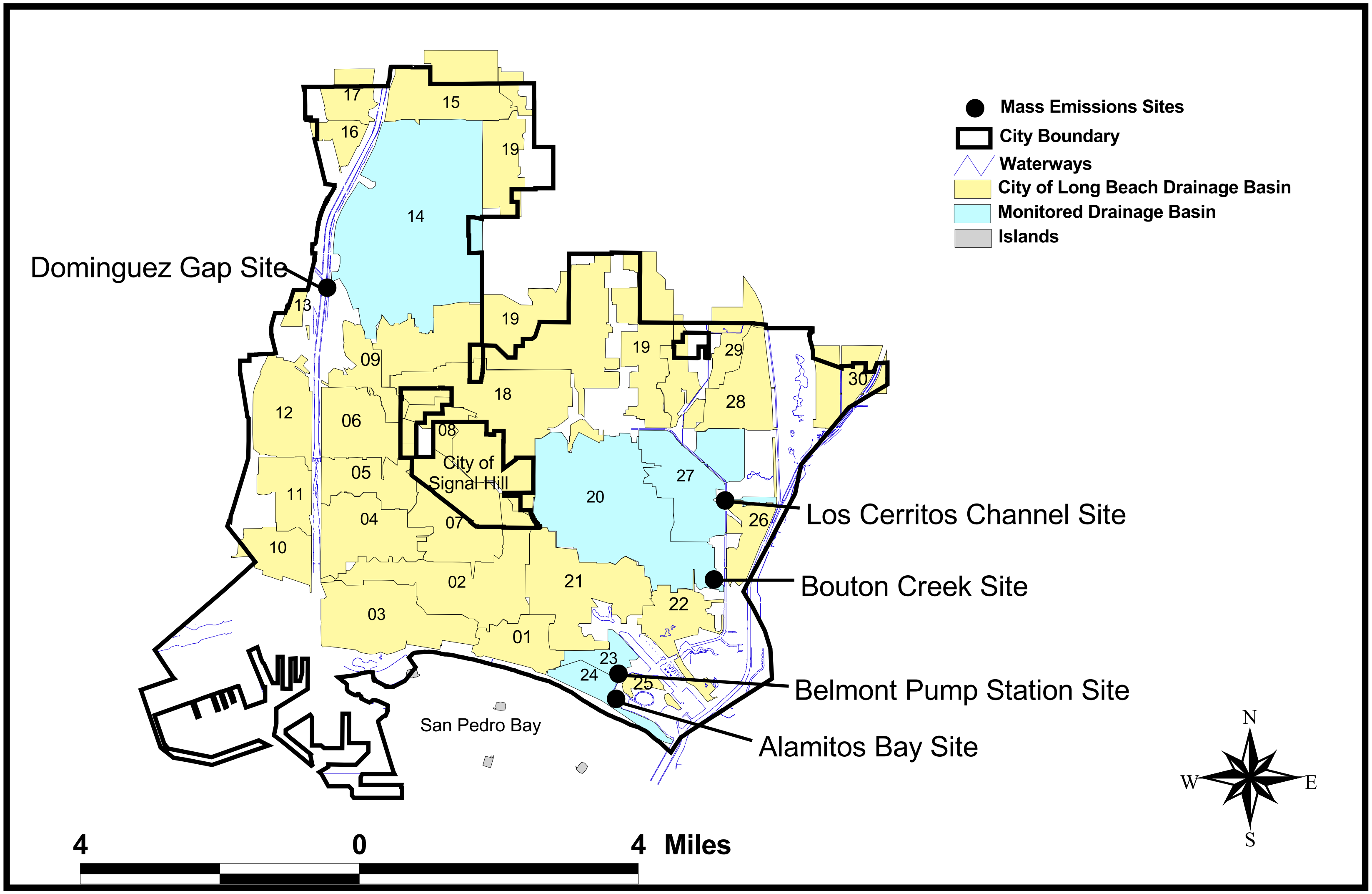

Figure 3.3. City of Long Beach Major Drainage Basins (Source: City of Long Beach, Department of Technology Services, last update 1994) and City of Long Beach Stormwater Monitoring Sites.

Table 3.1. Total Areas and Land Use for City of Long Beach Watersheds.

Drainage Basin	Drainage Pattern	Sub-basins	Total Acres	Residential Acres	Commercial Acres	Industrial Acres	Institutional Acres	Open Space Acres
1	N to S	4	456	393	44	0	7	12
2	E to W	1	1,276	905	287	22	59	3
3	E to W	3	1,083	367	642	7	58	9
4	E to W	2	810	426	176	140	56	12
5	E to W	1	546	434	97	0	13	2
6	S & SE	1	695	475	125	0	73	17
7	to center	1	1,029	858	89	11	53	18
8	E to W	1	248	163	27	58	0	0
9	SW & NW	1	399	295	91	0	12	1
10	S & E	3	416	16	49	351	0	0
11	S & E	1	424	338	64	3	18	1
12	S & E	1	719	556	98	9	41	15
13	S & E	1	84	0	7	77	0	0
14	S & W	2	3,374	2,445	392	148	273	116
15	S & W	1	958	569	167	197	25	0
16	N to S	1	194	113	61	8	5	7
17	S & E	1	317	244	68	0	5	0
18	E	1	1,814	804	262	729	19	0
19	E	20	3,898	2,475	610	439	228	146
20	S & E	1	2,259	1,215	412	70	492	70
21	S & E	3	1,172	773	125	0	55	219
22	variable	9	520	38	428	0	54	0
23	S	1	213	110	85	0	14	4
24	SE & NW	1	281	188	30	0	0	63
25	W & E	2	90	70	9	0	4	7
26	S & W	3	355	304	22	0	29	0
27	E & S	9	1,083	825	109	0	143	6
28	S & E	1	630	386	179	0	65	0
29	S	8	727	633	10	0	26	58
30	SW(6) & SE(1)	7	546	508	19	0	19	0
		Total Acres	26,616	16,926	4,784	2,269	1,846	786

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4.0 MONITORING PROGRAM

4.1. Monitoring Program Objectives

The stated long-term objectives of the storm water monitoring program are as follows:

1. Estimate annual mass emissions of pollutants discharged to surface waters through the MS4;
2. Evaluate water column and sediment toxicity in receiving waters;
3. Evaluate impact of storm water/urban runoff on marine life in receiving waters;
4. Determine and prioritize pollutants of concern in storm water;
5 Identify pollutant sources on the basis of flow sampling, facility inspections, and ICID investigations; and
6. Evaluate BMP effectiveness.

The emphasis during the first full year of monitoring efforts was to begin to characterize the chemical and toxicological characteristics of discharges from the city's MS4 during both storm events and during dry weather periods in order to address the first five objectives listed above. In addition, a start on BMP investigations through the special Parking Lot Study was implemented during this period. Specific objectives of this years work included the following:

1. Establish and instrument four automatic storm water monitoring stations capable of flow composited sampling at the four mass emission sites specified in the Permit.
2. Obtain monitoring data from four (4) storm events for each mass emission station during the 2000-2001 storm season along with corresponding receiving water sampling at the Alamitos Bay receiving water station.
3. Carry out dry weather inspections and obtain samples of dry weather flow at each of the four mass emission stations and the receiving water station. Perform this dry weather work twice during the dry season that extends from May through October.
4. Perform chemical analyses for the specified suite of analytes at the appropriate detection limits for all storm water samples collected.
5. Perform toxicity testing of the storm water samples collected, and Toxicity Identification Evaluations (TIEs) if warranted by the toxicity results at a given site.
6. Complete a special research study on parking lot runoff and associated BMP practices.
7. Report the above results and carry out an initial evaluation of the monitoring data.

4.2 Monitoring Site Descriptions

4.2.1 Basin 14: Dominguez Gap Monitoring Site

A sampling station located at the Dominguez Gap Pump Station is intended to monitor Basin 14 that covers 3,374 acres. Land use in this basin is 72% residential, 12% commercial, 8% institutional, 4% industrial, and 4% open space (Figure 4.1). The basin is located in the northwestern portion of Long Beach just east of the Los Angeles River and is bounded on the north, south, east, and west by Artesia Boulevard, Roosevelt Road, the railroad, and the Los Angeles River respectively (City of Long Beach, 2001). The location of the Dominguez Gap Pump Station is shown in Figure 4.2 with the coordinates given in Table 4.1. Photographs of the site are shown in Figure 4.3.

Normally in the summer, the retention basin located adjacent to the pump station would be dry according to the Flood Maintenance Division of the Los Angeles Public Works. However, current practice is to have the pumps locked off for the summer with water diverted into the retention basin from the Los Angeles River to recharge the groundwater aquifer and to study the feasibility of a wetland habitat in the area. During winter storms, the retention basin fills from storm water discharge, which then infiltrates into the groundwater. During intense rains, when the retention basin fills to a specified level, the pump station pumps the water over the levee and discharges it into the Los Angeles River.

The storm water monitoring equipment was located within the Dominguez Gap Pump Station. The automatic sampler utilized a peristaltic pump to collect water from the pump station's sump. The sampler was activated at the same set point (sump elevation) that activated the main discharge pumps, thus obtaining water samples during discharge to the Los Angeles River. Sump elevation was determined with a pressure transducer. Flow rates were determined from the individual pump curves of each pump, and total volume discharged was obtained by integrating this data over the period of time each pump discharged.

Table 4.1. Location Coordinates of Monitoring Stations for the City of Long Beach Storm Water Monitoring Program.

Station Name	State Plane Coordinates: Zone 5 Northing (ft)	State Plane Coordinates: Zone 5 Easting (ft)	North American Datum (NAD) 83 Latitude	North American Datum (NAD) 83 Longitude
Belmont Pump	1734834.9	6522091.2	33° 45' 36.6"N	118° 07' 48.7"W
Bouton Creek	1741960.5	6529305.2	33° 46' 44.3"N	118° 06' 23.4"W
Cerritos Channel	1747935.9	6530153.2	33° 47' 43.3"N	118° 06'13.4"W
Dominguez Gap	1764025.0	6500042.5	33° 50' 22.1"N	118° 12' 10.5"W
Alamitos Bay (Floating Dock)	1732942.2	6521892.8	33° 45' 15.0"N	118° 07' 52.0"W
Alamitos Bay (Dry-Weather Outfall)	1732807.4	6521874.4	33° 45' 13.7"N	118° 07' 54.2"W

Land Use of Drainage Basin 14

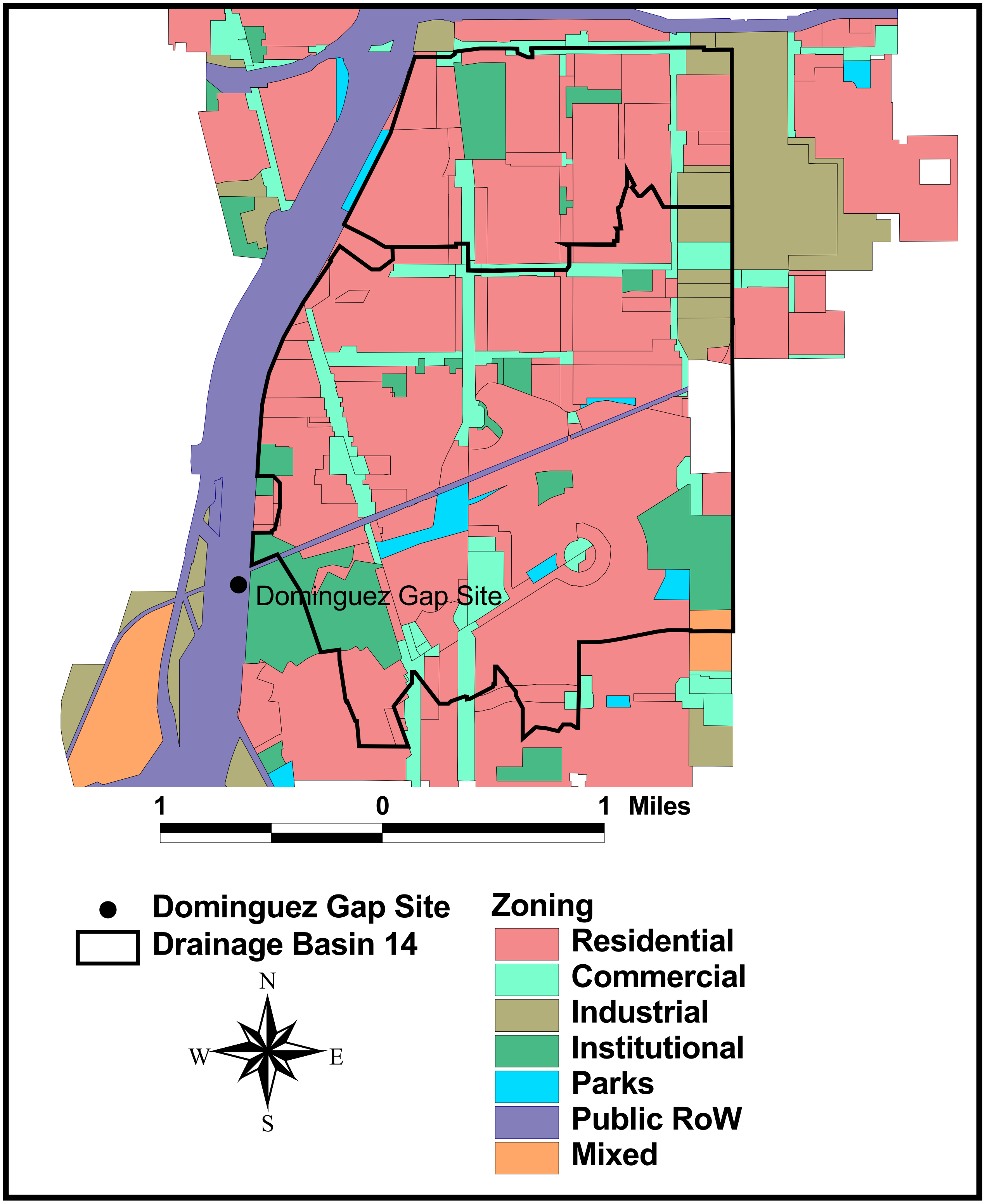

Figure 4.1. Land Use of Drainage Basin #14 which Drains to the Dominguez Gap Mass Emissions Site (Source: City of Long Beach Department of Technology Services, last update 12/20/00).

Dominguez Gap Site Drainage Basin

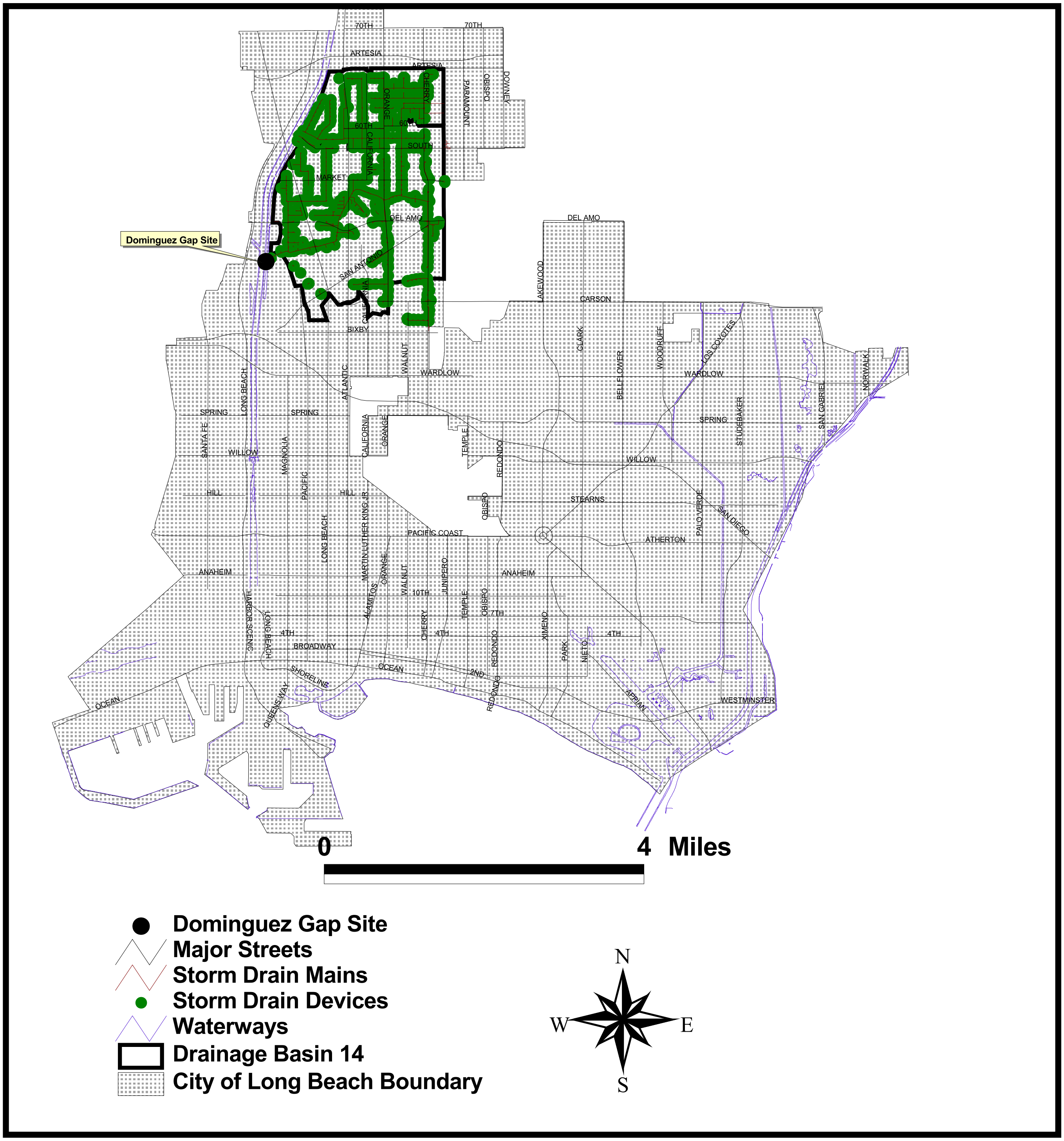

Figure 4.2. Dominguez Gap Mass Emissions Site and the City of Long Beach Drainage Basin #14. (Source: City of Long Beach, Department of Technology Services, last updated 1/9/00).

Figure 4.3 Dominguez Gap Pump Station Monitoring Site – Forebay and Monitoring Equipment

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4.2.2 Basin 20: Bouton Creek Monitoring Site

This site collects water from Basin 20 covering 2,259 acres. Basin 20 is 54% residential, 22% institutional, 18% commercial, 3% industrial, and 3% open space (Figure 4.4). This basin is located in the east central portion of the City and is bounded on the north, south, east, and west by Spring Street, 8th Avenue, the Los Cerritos Channel and Redondo Avenue, respectively. The sampling station is located a short way upstream from the point of discharge into Los Cerritos Channel, along side of the Alamitos Maintenance Yard of the Los Angeles County Public Works Department. The location of the sampling station is shown in Figure 4.5 and Table 4.1. Photographs of the site are shown in Figure 4.6.

At the sampling station, Bouton Creek is a 35 ft wide, 8.5 ft deep open concrete box channel. The elevation of the channel bed is approximately one inch lower at the side than the center. About a quarter of a mile to the southeast, Bouton Creek flows into Los Cerritos Channel. Based on numerous observations of conductivity at various tides, this site has saltwater influence at tide levels above three feet. The automatic sampling equipment was therefore configured and programmed to measure discharge flow and to obtain flow composited samples of the freshwater discharge down the creek, avoiding the tidal contributions by using real-time conductivity sensors. A velocity sensor was mounted on the invert of the box channel near the center of flow. Two conductivity sensors were mounted on the wall of the channel near the bottom and 2 feet above the bottom. A third conductivity sensor and the sample intake were mounted on a floating arm that kept them near the surface.

4.2.3 Basin 23: Belmont Pump Station Monitoring Site

This site collects water from Basin 23 that covers 213 acres. Land use in the basin is 52% residential, 40% commercial, 0% industrial, 6% institutional, and 2% open space (Figure 4.7). This basin is located in the southeastern portion of the City and is bounded on the north, south, east, and west by Colorado Street, Division Street, Ultimo Avenue and Belmont Avenue respectively. The Belmont Pump Station is located at 222 Claremont Avenue as shown in Figure 4.8 with coordinates given in Table 4.1. Photographs of this site are shown in Figure 4.9.

Water enters the forebay of the facility via a nine-foot diameter underground storm pipe. A trash rack catches debris before water drops four feet into the sump area. A single sump pump typically comes on and discharges about two feet of water from the sump area every evening at around 2300 hours. Four main pumps are available to remove water during storm events. Water from these pumps is discharged into Alamitos Bay.

The storm water monitoring equipment was located outside the pump station but on the grounds of the pump station inside a steel utility box. The sensors and sampling hose were installed inside the pump station sump adjacent to the large discharge pumps. The automatic sampler utilized a peristaltic pump to sample from the sump. The sampler was activated at the same set point (sump elevation) that activated the discharge pumps, thus obtaining water samples during the discharge to Alamitos Bay. Sump elevation was determined with a pressure transducer. Flow rates were determined from the individual pump curves of each pump, and total volume discharged obtained by integrating this data over the period of time each pump discharged.

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Land Use of Drainage Basin 20

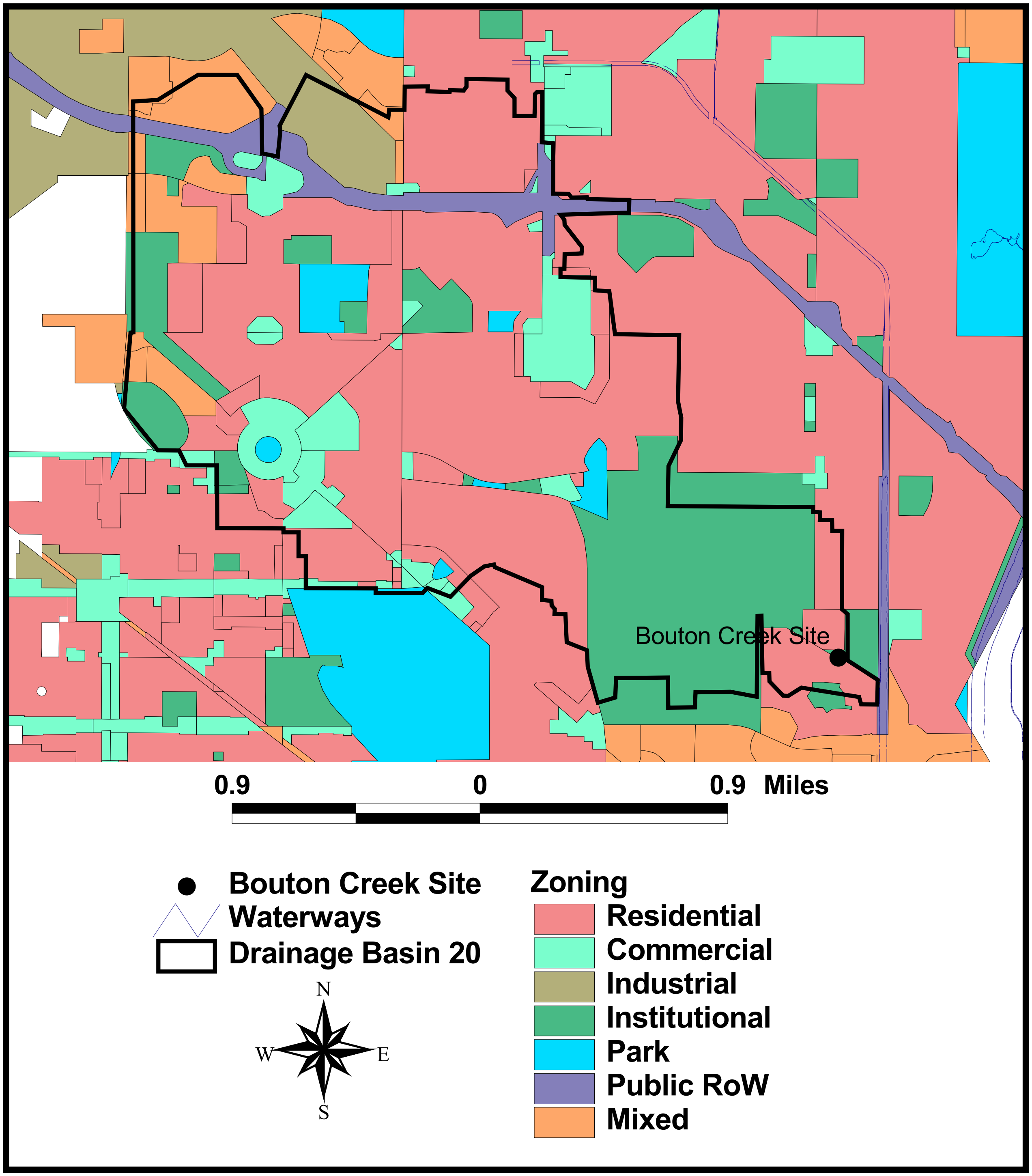

Figure 4.4. Land Use of Drainage Basin #20 which Drains to the Bouton Creek Mass Emissions Site (Source: City of Long Beach, Department of Technology Services, last updated 12/20/00).

Bouton Creek Site Drainage Basin

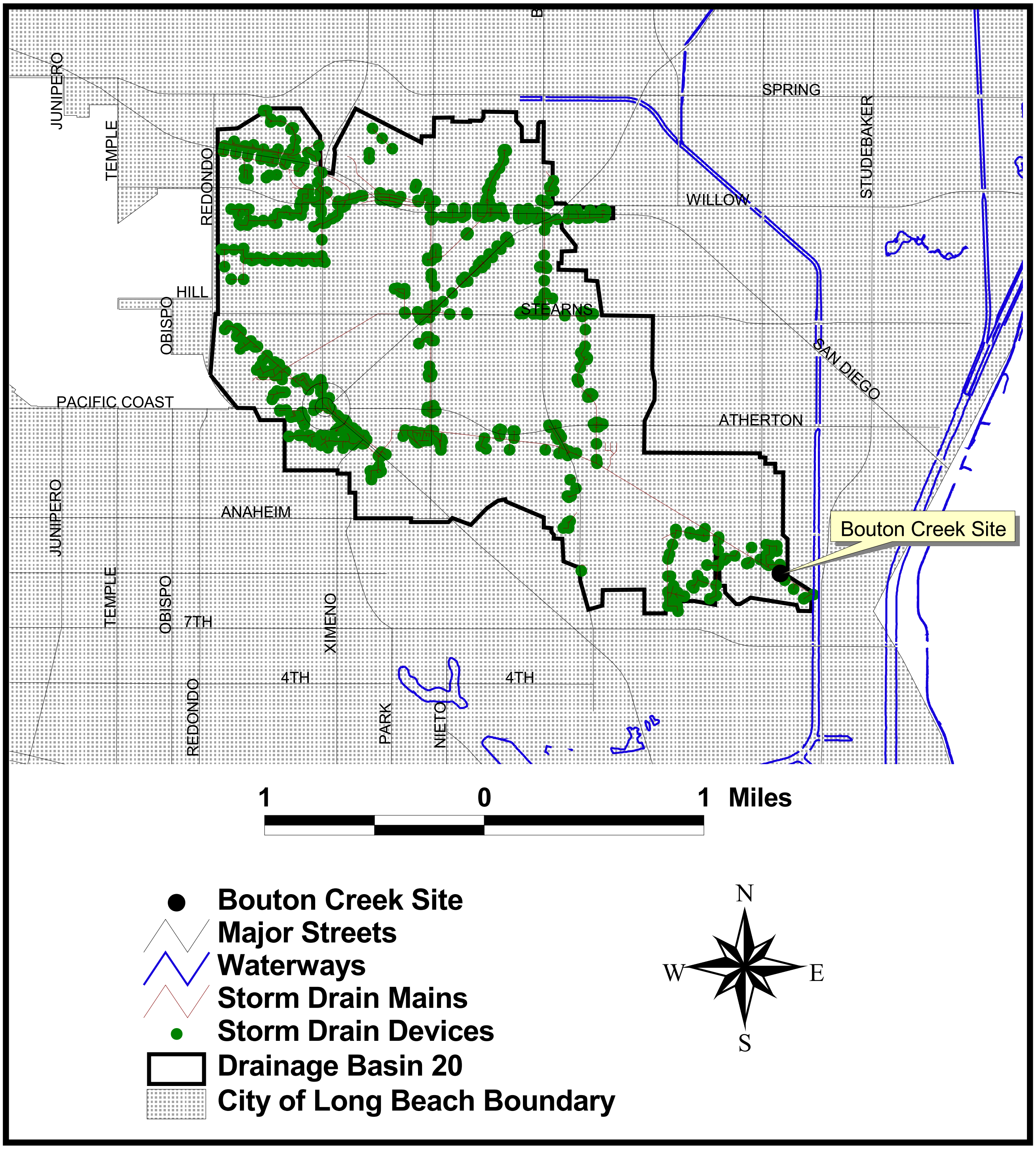

Figure 4.5. Bouton Creek Mass Emissions Site and City of Long Beach Drainage Basin #20. (Source: City of Long Beach, Department of Technology Services, last updated 1/9/00).

Figure 4.6 Bouton Creek Monitoring Site – Channel and Monitoring Equipment

Land Use of Drainage Basin 23

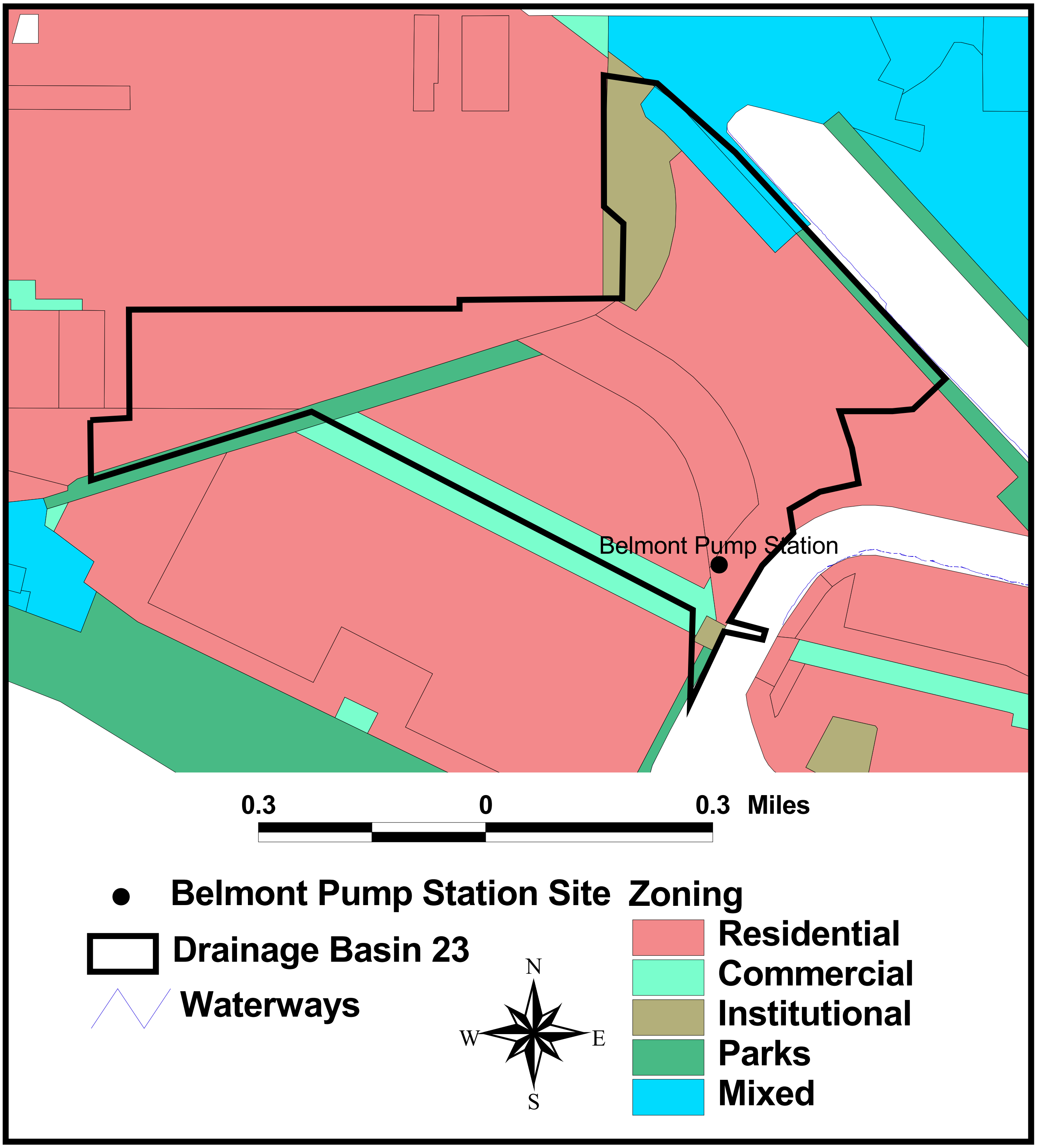

Figure 4.7. Land Use of Drainage Basin #23 which Drains to the Belmont Pump Station Mass Emissions Site (Source: City of Long Beach, Department of Technology Services, last updated 12/20/00).

Belmont Pump Station Drainage Basin

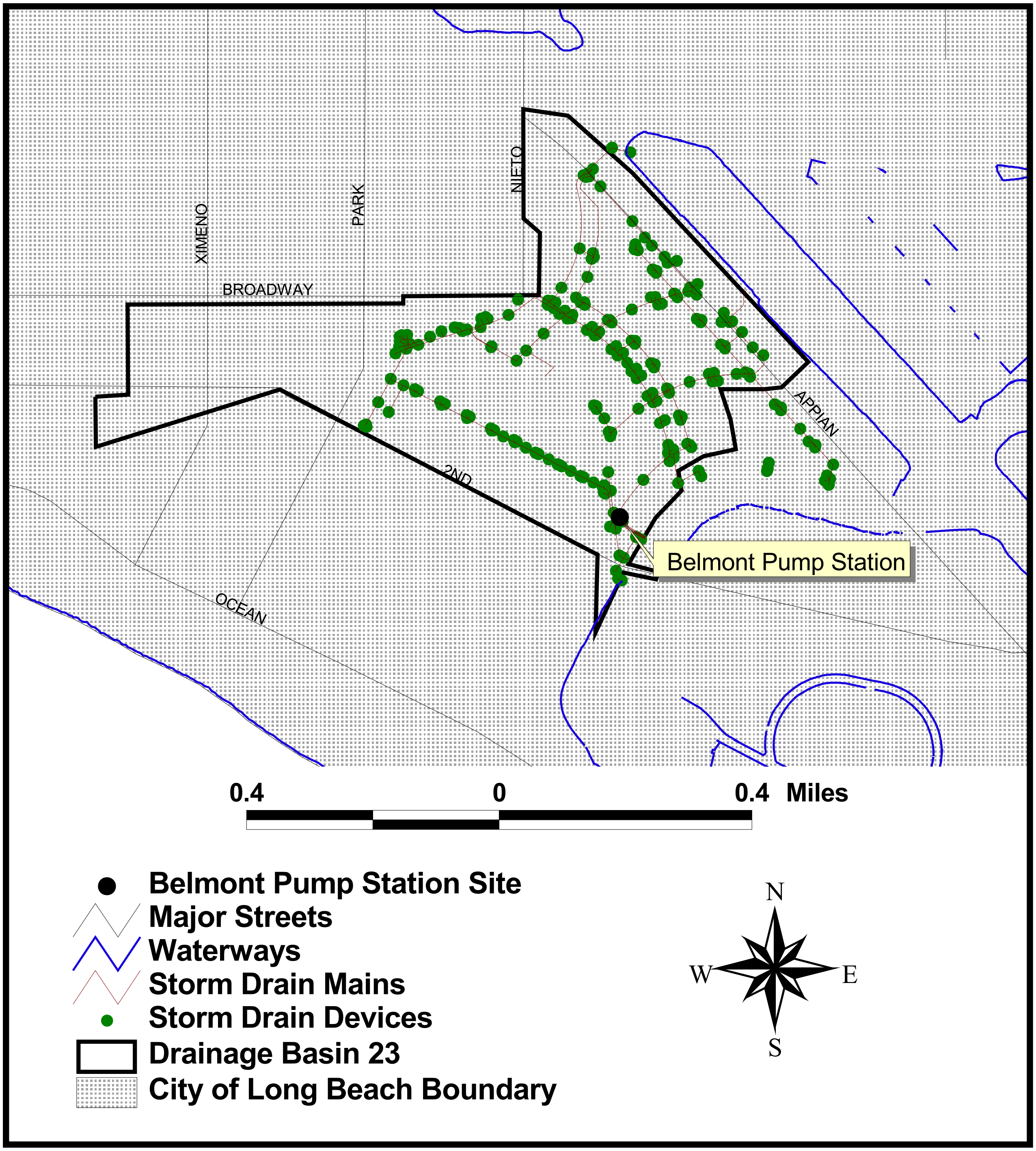

Figure 4.8. Belmont Pump Station Mass Emissions Site and City of Long Beach Drainage Basin #23. (Source: City of Long Beach, Department of Technology Services, last updated 1/9/00).

Figure 4.9 Belmont Pump Station Monitoring Site – Pump Station Outfall and Monitoring Equipment

4.2.4 Basin 27: Los Cerritos Channel Monitoring Site

Basin 27 is 1,083 acres and land use is 76% residential, 10% commercial, 13% institutional, and 1% open space (Figure 4.10). It is located in the east central portion of Long Beach and is bound on the north, south, east, and west by Spring Street, Rendina Street, the San Gabriel River, and Bellflower Boulevard, respectively.

The drainage pattern is to the east and south on the west side of the Los Cerritos Channel and to the west and south on the east side. There are eight major storm drain systems with a total of three major storm drain lines contributing runoff. All eight major systems discharge into the Los Cerritos Channel.

The storm water monitoring station was installed in a steel utility box located on the west side of the channel south of Stearns Street. The site location and coordinates are shown in Figure 4.11 and in Table 4.1. Photographs of the site are shown in Figure 4.12. Flow sensors and sampling tubing was installed on the bottom of the large concrete lined channel. This sampling site is above tidewater on Los Cerritos Channel. Flow rates based upon flow velocity and channel dimensions are used to control the composite sampler, and to calculate total flow at the end of the storm event.

4.2.5 Alamitos Bay Receiving Water Monitoring Site

Alamitos Bay, located along the southeastern shoreline of Long Beach, is an extensive inshore estuarine area opening to the waters of the Outer Harbor. It supports extensive marina and recreational uses as well as residential/commercial uses in nearby areas. It also receives storm water runoff from the Los Cerritos Channel and local drainage basins.

The Bayshore Aquatic Park on the southwestern shore of Alamitos Bay was selected and designated in the permit to be the receiving water site for this storm water monitoring study. This site is downstream of the monitoring sites for Basins 20 and 23 but also receives storm water from other basins as well. The monitoring site selected was at the end of a floating wharf located approximately 41 meters 188 degrees true north of the Alamitos Bay Pump Station outfall (Figure 3.3, Table 4.1). The end of the outfall pipe to Alamitos Bay is elevated above the surface of the water of the Bay. Grab samples were taken at the end of the dock during an in-coming tide for bacteria and toxicity only.

The Alamitos Bay Pump Station discharges storm water from Basin 24 (Figure 4.13). Basin 24 consists of 281 acres located along the south shore of Alamitos Bay and westward along the shore of the Outer Harbor. Land use in Basin 24 consists of 67% residential, 11% commercial, and 22% open space with no industrial or institutional land use (Figure 4.14). Photographs of the site are shown in Figure 4.15. A dry-weather storm drain diversion project was constructed in the fall of 1999 for Basin 24. This diversion was activated May 1, 200 to divert dry weather flows to the sanitary system. The results from monitoring this site were also intended to help in the assessment of the effectiveness of this dry weather diversion.

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Land Use of Drainage Basin 27

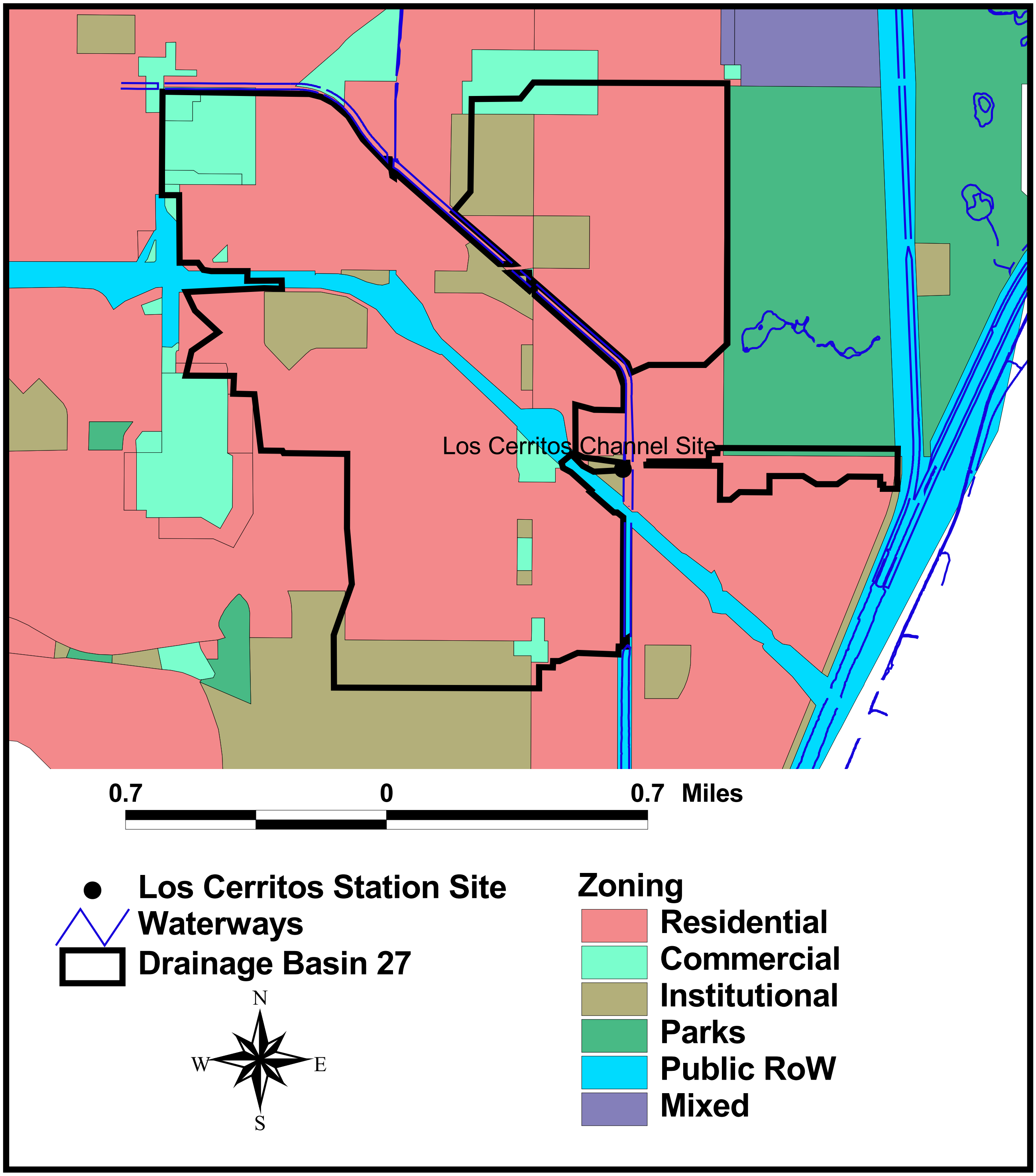


Figure 4.10. Land Use of Drainage Basin #27 which Drains to the Los Cerritos Channel Monitoring Site. (Source: City of Long Beach, Department of Technology Services, last updated 12/20/2000)

Los Cerritos Channel Site Drainage Basin

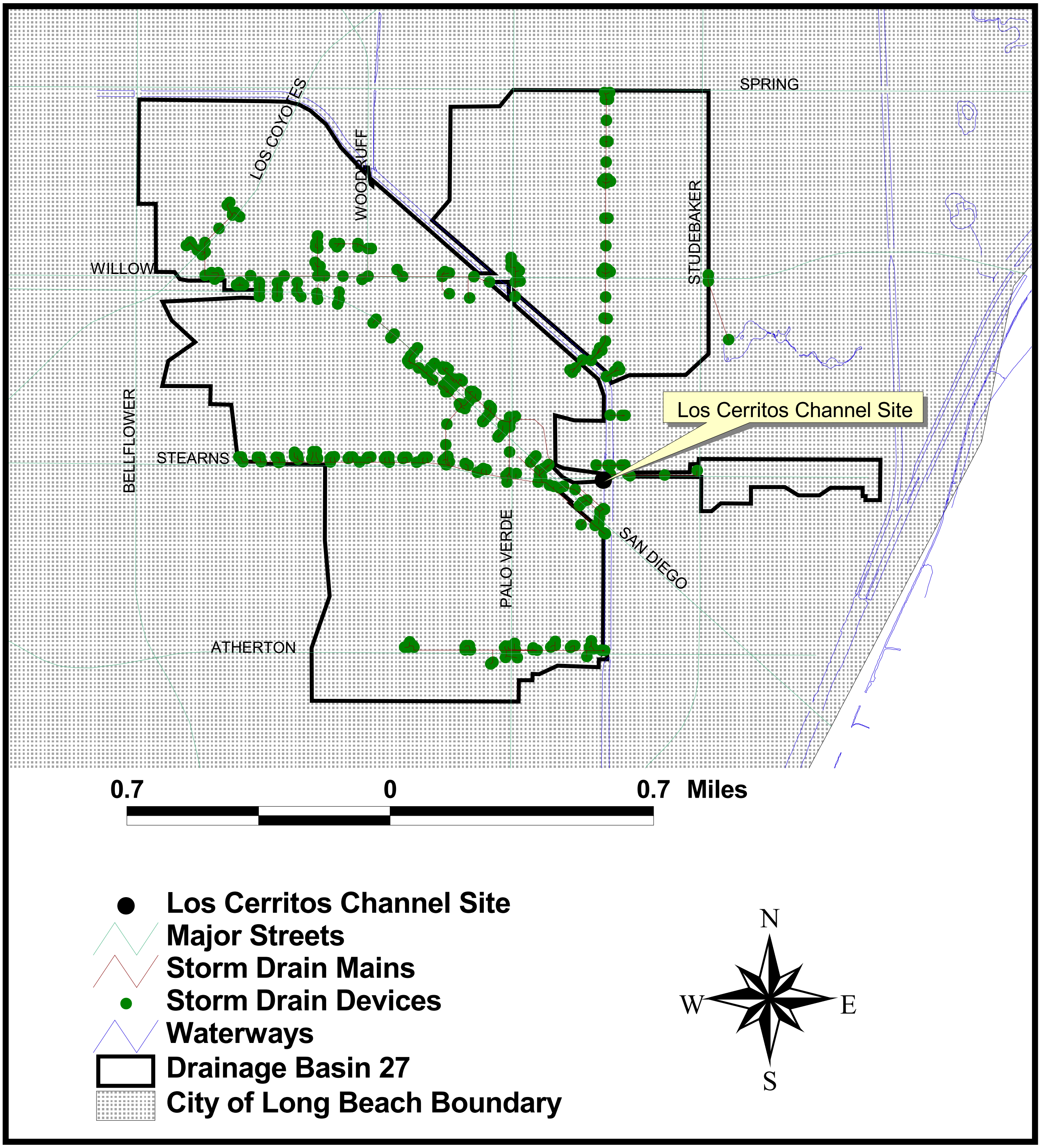


Figure 4.11. Los Cerritos Channel Mass Emissions Site and City of Long Beach Drainage Basin #27. (Source: City of Long Beach, Department of Technology Services, last updated 1/9/00).

Figure 4.12 Cerritos Channel Monitoring Site – Channel and Monitoring Equipment

Land Use of Drainage Basin 24

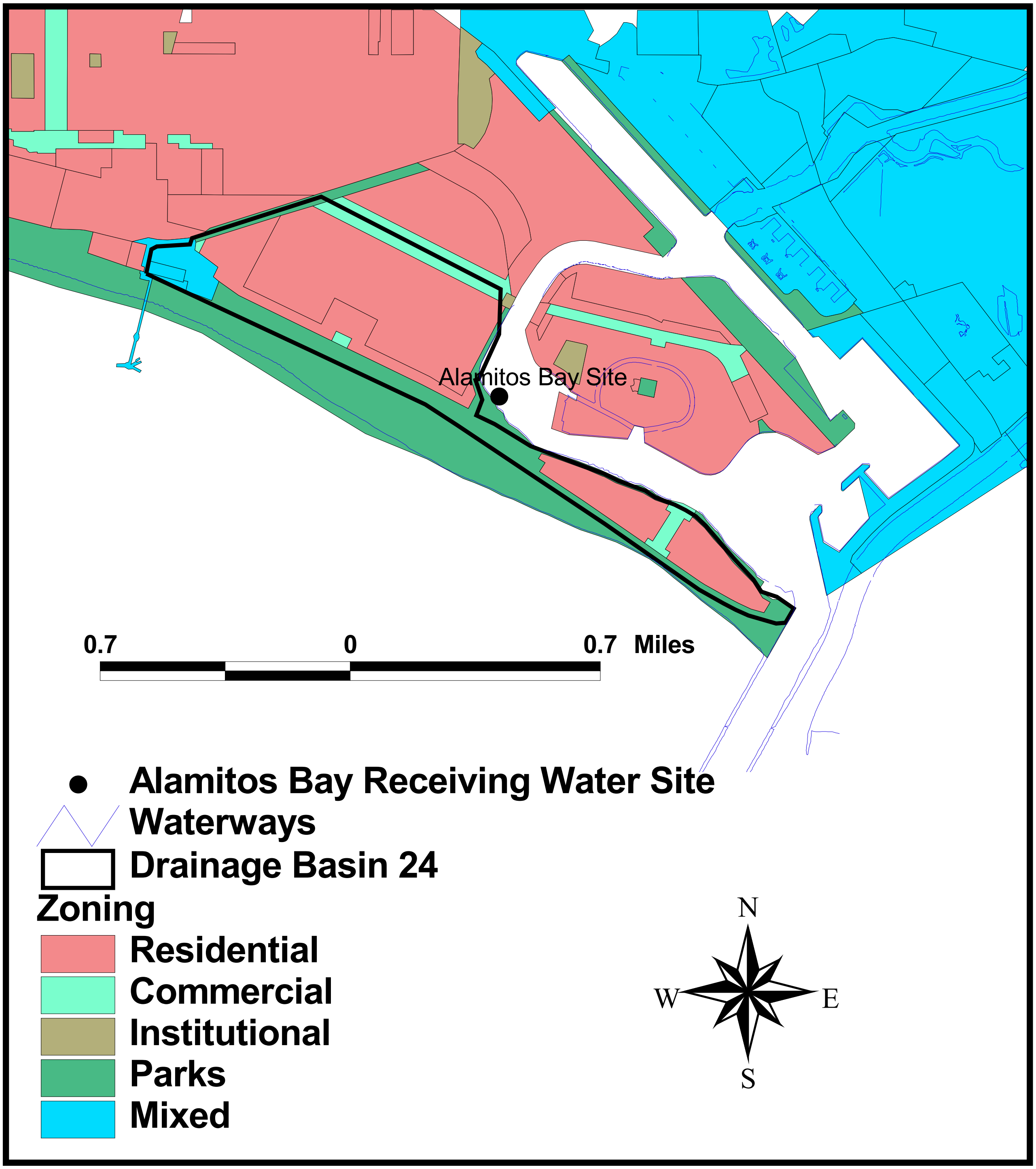


Figure 4.13 Land Use of Drainage Basin #24 which Drains to Alamitos Bay.
(Source: City of Long Beach, Department of Technology Services, last updated 12/20/00).

Alamitos Bay Site Drainage Basin

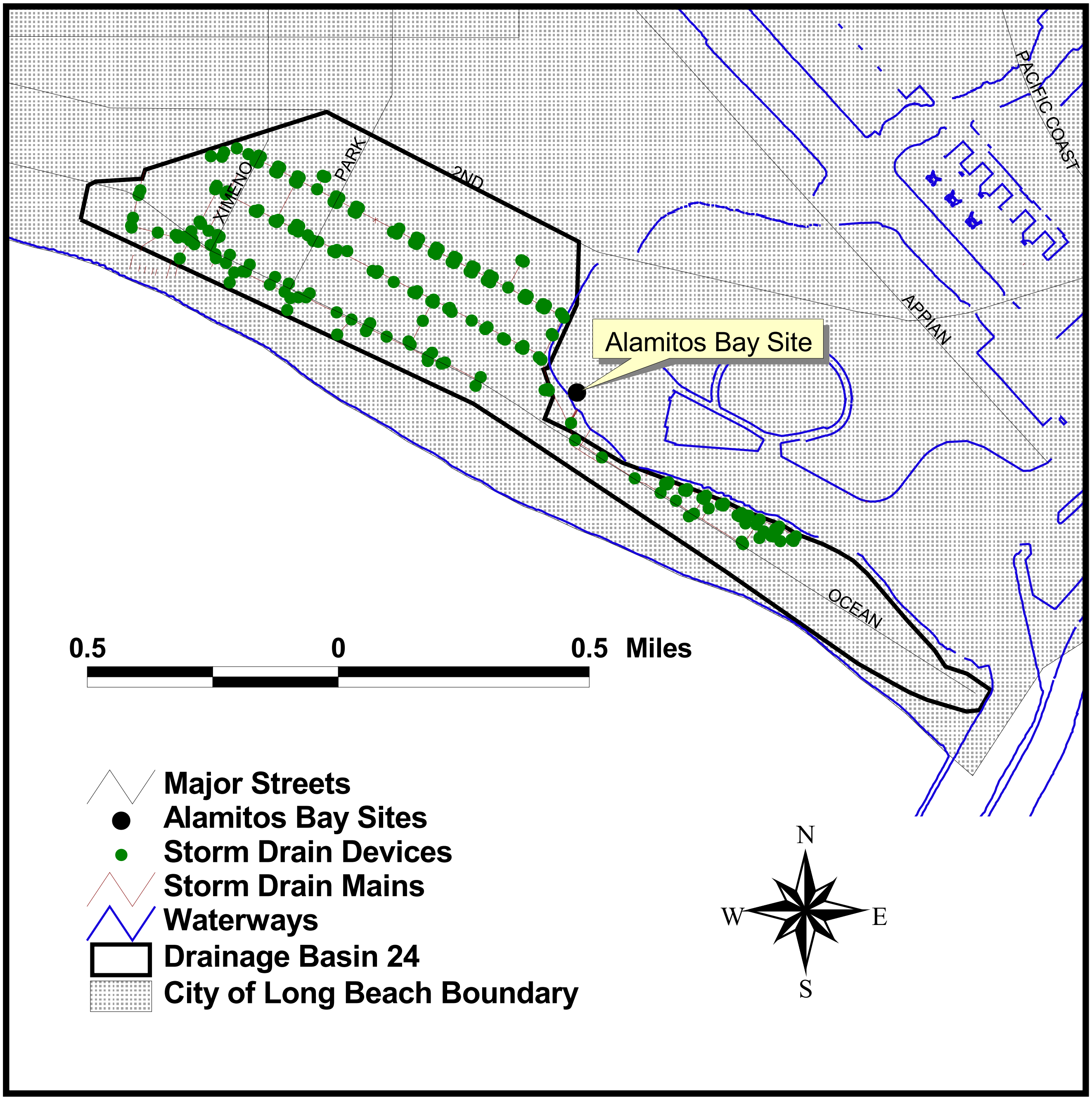


Figure 4.14. Alamitos Bay Receiving Water Site and City of Long Beach Drainage Basin #24. (Source: City of Long Beach, Department of Technology Services, last updated 1/9/00).

Figure 4.15 Alamitos Bay Receiving Water Monitoring Site – Sampling Site and Closeup of Outfall

4.3 Monitoring Station Design and Configuration

Each of the four land use stations monitored in Long Beach were equipped with Kinnetic Laboratories Automatic Sampling System (KLASS). Figure 4.16 illustrates the configuration of a typical KLASS. This system consists of several commercially available components that Kinnetic Laboratories has integrated and programmed into an efficient flow-based storm water compositing sampler. The receiving water site was not equipped with a KLASS.

The integral components of this system consist of an acoustic Doppler flow meter or a pressure transducer, a data logger/controller module, cellular or landline telecommunications equipment, a rain gauge, and a peristaltic sampler. In addition, the Bouton Creek station incorporates conductivity cells for the purpose of distinguishing tidal flow from fresh water runoff.

The equipment was installed with intakes and sensors securely mounted, tubing and wires in conduits, and all above ground instruments protected within a security enclosure. Section 4.2 described how the equipment was placed at each station.

All materials used in the collection of storm water samples and in contact with the samples met strict criteria in order to prevent any form of contamination of the sample. These materials must allow both inorganic and organic trace toxicant analyses from the same sampler and composite bottle. Only the highest grade of borosilicate glass is suitable for both trace metal and organic analyses from the same composite sample bottle. Sample hoses were Teflon®.

All bottles and hoses were cleaned according to EPA-approved protocols consistent with approved methodology for analysis of storm water samples (USEPA, 1983). These bottles and hoses were then evaluated through a composite bottle blanking process to verify that the hoses and composite bottles were contamination-free and appropriately cleaned for both analyses of inorganic and organic constituents.

The KLASS equipment incorporates telecommunications. Telecommunication capabilities provide an important link to ensure that data meet high quality standards. The ability to access a sampling station, monitor the status of the station in real-time, modify storm criteria, download new programs, and simply recover data allows for more cost effective, efficient monitoring. In addition, modem communication allows for remote initiation of sampling within minutes after weather reports indicate an acceptable storm.

4.4 Field Monitoring Procedures

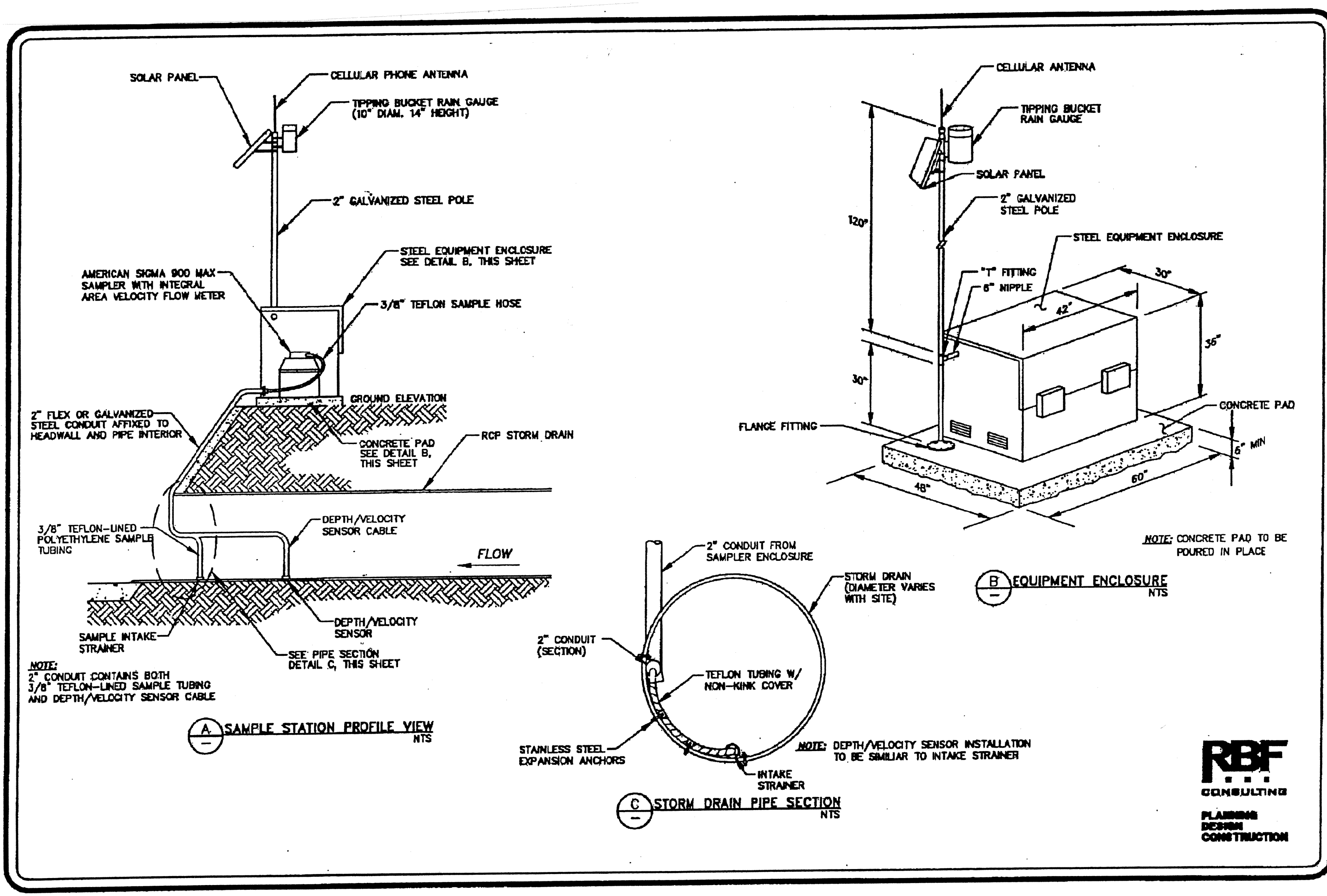
4.4.1 Wet Weather Monitoring

4.4.1.1 Composite Sample Collection

A priority objective of the storm monitoring was to maximize the percent storm capture of the composite sample, while ensuring that the composite bottle collects enough water to support all the required analyses. This study required approximately 70 liters of sample from each of the four land use sites to meet these analytical needs.

All aspects of the sampling events were continuously tracked from an office command and control center (Storm Control) located at our Santa Cruz laboratory. The status of each station was ascertained at any time through telecommunications with the site. Station data were

Figure 4.16 Typical KLASS Storm Water Monitoring Station.



downloaded, and the stations were controlled and reprogrammed remotely. Weather information, including Doppler displays of rainfall for each area being monitored were also available on screen at the Storm Control center. In addition, Storm Control was in contact by cellular phone with the field crews.

When a storm was likely, all stations were made ready to sample. This preparation included entering the correct volume of runoff required for each sample aliquot ("Volume to Sample"), setting the automatic sampler and the data logger to sampling mode, pre-icing the composite sample bottle, and performing a general equipment inspection. A brief physical inspection of the equipment was made if possible to make certain that there were no obvious problems such as broken conduit, a kinked hose, or debris.

As the storm approached and a final determination was made to monitor the event, stations were unlocked electronically (put into storm mode). Once "unlocked" the stations were set to start sampling when flow in the conveyance exceeds the preset, site-specific minimum value (stage) typically determined by the height of the water intake. When this stage was reached, the station began sampling. Sampling was halted whenever the stage went below this value. Flow was monitored while stage was below the sample intake but this flow was considered to be "un-sampled" and would result in lowering of the "Percent Capture" value. Sampling would again commence when stage increased above the sample intake.

Station sampling parameters were set remotely just prior to the onset of rain. This enabled use of the latest weather predictions to set station sampling parameters at optimal values. The most important parameter is the "Volume to Sample" ratio (basically how fast the sampler will take samples). Large 20 liter bottles were used to provide extra capacity so that it was more likely to end up with full, representative storm coverage. Since 70 liters were necessary to run the required chemical analyses, the Volume to Sample was typically set conservatively low to improve chances of getting sufficient water from marginal storm events.

Storm Control deployed field crews either when it appeared that it would be necessary to change out a bottle or as rainfall and flow diminished at each station. As noted earlier, Storm Control would end an event when all flow from a given rainfall had been monitored. Monitoring was never intentionally ended before zero flow was achieved. If flow dropped off to near zero and sufficient volume of sample was collected, the event was terminated.

At the pump stations, it was common practice to manually fill, using the peristaltic pump, additional bottles of sample after the pump(s) had halted and auto-sampling had finished. This was to insure that sufficient volume of sample had been acquired to perform all analyses if the pumps did not come on again. This practice was only done at the pump stations since the water in the sumps approximated a composite sample. If sufficient volume of sample was collected automatically, then the supplemental samples were discarded.

Upon each site visit, whether during storm mode or not, records of the visit were recorded in the field log. The log sheet was used as a guide for the exact data needed. Whenever possible, data was verified by the field crew while at the station, for example time, water level, flow, etc.

The following general information was filled in during all site visits:

- Alpha-numeric station ID
- Date
- Julian day

- Station name
- Field crew
- Time (arrival & departure)
- Weather conditions
- Turbidity of the runoff
- Runoff causing erosion
- Oil
- Floating material
- Other observations

During each station visit, several data logger display locations were recorded. The log sheets were used as a guide to the proper display locations to record, as each station had its own unique set of data. In general, however, the following data were recorded at each station:

- Temperature
- Data logger stage
- Velocity (f/s)
- Q (flow in cfs)
- Station ID
- Data logger Battery Voltage
- Flow Meter Battery Voltage

The following additional data were recorded in the logbooks during storm monitoring, and are uniformly required at all stations.

- Volume (kcf) - This is the volume of water that passed the station during the previous execution interval (one minute).

- Storm Sum - This indicates the accumulated runoff volume in kilo cubic feet (kcf) that has passed the station since the last sample.

- Percent Storm Capture - This indicates the percent of the storm effectively sampled by the monitoring equipment, and it provides a quick evaluation of the quality of the monitoring.

- Volume to Sample -This value indicates the runoff volume (in kcf) that must pass the station before the monitoring equipment will take the next sample.

- Sample Count - This number indicates the number of sample aliquots collected in the current bottle. It automatically re-zeros every time a bottle is filled.

- Total Rain (inches) - The total rainfall in inches since the start of the storm. This is accumulated each time that the rain bucket tips.

- Maximum Flow (day) - This indicates the Julian day on which the maximum flow occurred.

- Maximum Flow (time) - When this number is positive, it indicates that the system was sampling during peak flow. If this number is negative, sampling did not occur during the peak flow because the bottle was full.

- Maximum Stage (feet) - This indicates the height of the maximum stage during the current storm.

- Maximum Flow (cfs) - This indicates the maximum flow rate during the current storm.

- Storm Volume (kcf) - This indicates the total volume of water that has flowed past the station since the beginning of the storm.

- Storm Volume Sampled (kcf) - This indicates the total volume of water that flowed past the station while the system was able to collect samples.

When the sample bottle was full, the system was reset immediately, and the bottle replaced. Once the bottle was changed, all of the necessary station data was filled in on the field log sheets.

Once a storm event has ended, the stations were shut down. The station was left ready for the next storm event in case there was insufficient time for a maintenance visit between storms. Data was retrieved remotely via telecommunications from the data logger on a daily basis throughout the wet weather season.

All water samples were kept chilled (4ºC) and were transferred to the analytical laboratories within holding times. Prior to sample shipping, sub-sampling from the composite container into sample containers was accomplished using protocol cleaned Teflon and silicone sub-sampling hoses and a peristaltic pump. Using a large magnetic stirrer, all composite water was first mixed together thoroughly and then continuously mixed while the sub-sampling took place. All sub-sampling took place at a staging area near Long Beach. Documentation accompanying samples to the laboratories included Chain of Custody forms, and Analysis Request forms (complete with detection limits).

4.4.1.2 Grab Sampling

During each storm event, grab samples for oil and grease, total recoverable petroleum hydrocarbons (TRPH), total and fecal coliform, fecal streptococcus, and methyl tertiary butyl ether (MTBE) were collected. An attempt was made to collect all grab samples while the KLASS was taking its first sample during each storm event. Because of short holding times for the bacterial analyses, delivery to the analytical laboratories was also a consideration.

Some basic procedures were followed in order to ensure potential contamination was kept to a minimum. These are:

- All sample containers were kept in clean coolers until sampling was initiated
- Vehicles were turned off to minimize exposure to vehicle exhaust.
- Clean polyethylene gloves were worn when handling the sample containers.
- The bottle lid was kept clean and free of debris while the bottle was open.
- Sampling was kept to the upstream side of the person taking the samples.
- All filled sample bottles were kept in clean coolers at 4°C.

Prior to taking the grabs, the date and time of sampling were filled out on the labels. Except at the pump stations, all grab samples were taken near the center of flow as possible or at least in an area of sufficient velocity to ensure good mixing. At the Dominguez Gap sampling site, grabs were taken from the sump. At the Belmont pump station, grabs were taken at the point of discharge for the pumps. Some sites required the use of a pole to obtain the samples. Poles used were fitted with special bottle holders to secure the sampling containers. Care was taken not to overfill the sample containers for some of the containers contained preservative. For the MTBE samples, special procedures were used to eliminate any air bubbles in the sample vial.

4.4.2 Dry Weather Sampling

The NPDES Permit calls for two dry weather inspections and sampling events to be carried out during the summer dry weather period at each of the four mass emission stations as well as samples to be taken at the Alamitos Bay receiving water site.

Inspections at each site included whether water was present and whether this water was flowing or just ponded. At sites that were found not to have flowing water, inspections were done in the upstream drains to verify that flow was not occurring into the site. This situation was encountered again this year at the Dominguez Gap Pump station where remnants of water were still ponded in the basin in front of the pump station, but the storm drain discharges into this basin were dry.

When flowing water was present at one of these mass emission sites, then water quality measurements, flow estimates, and water samples were taken along with observations of site conditions. Flowing water was present and all measurements were taken at Bouton Creek, the Belmont Pump Station, and at Los Cerritos Channel. Temperature and conductivity were measured with an Orion Model 140 meter, pH with an Orion Model 250 meter, and oxygen was measured with a backup field test kit (RedSea Pharm, LTD) as the Orion Model 840 meter failed in the field.

Water samples were collected at the Belmont Pump Station and the Los Cerritos Channel Station by use of an automatic peristaltic pump sampler that collected aliquots every half hour for a 24-hour period. For the Bouton Creek Station where tidal influences are present, a similar sample was collected over a 4-hour period of low tide in order to sample just the fresh water discharge down the creek. Additional grab samples were taken just after the time-composited samples for MTBE, TPH, and bacteria. All samples were chilled to 4 ^{0}C and transported to the appropriate laboratory for analysis.

4.5 Laboratory Analyses

The water quality constituents selected for this program were established based upon the requirements of the City of Long Beach NPDES permit for storm water discharges. Analytical methods are based upon approved USEPA methodology. The following sections detail laboratory methods for chemical and biological testing.

4.5.1 Analytical Suite and Methods

Conventional, bacteriological, and chemical constituents selected for inclusion in this storm water quality program are presented in Table 4.2. Analytical method numbers, holding times, and reporting limits are also indicated for each analysis.

4.5.1.1 Laboratory QA/QC

Quality Assurance/ Quality Control (QA/QC) activities associated with laboratory analyses are detailed in Appendix A.

The laboratory QA/QC activities provide information needed to assess potential laboratory contamination, analytical precision and accuracy, and representativeness. Analytical quality assurance for this program included the following:

- Employing analytical chemists trained in the procedures to be followed.
- Adherence to documented procedures, USEPA methods and written SOPs.
- Calibration of analytical instruments.
- Use of quality control samples, internal standards, surrogates and SRMs.
- Complete documentation of sample tracking and analysis.

Internal laboratory quality control checks included the use of internal standards, method blanks, matrix spike/spike duplicates, duplicates, laboratory control spikes and Standard Reference Materials (SRMs).

Data validation was performed in accordance with the National Functional Guidelines for Organic Data Review (EPA540/R-94/012), Inorganic Data Review (EPA540/R-94/013), and Guidance on the Documentation and Evaluation of Trace Metals Data Collected for the Clean Water Act Compliance Monitoring (EPA/821/B/95/002).

Table 4.2. Analytical Methods, Holding Times, and Reporting Limits.

Analyte and Reporting Unit	EPA Method Number	Holding Time	Target Reporting Limit
CONVENTIONAL PARAMETERS			
Oil and Grease (mg/L)	1664	28 days	5.0
Total Phenols (mg/L)	420.1	28 days	0.1
Cyanide ((µg/L)	335.2	14 days	10
pH (units)	150.1	15 min	0.1
Dissolved Phosphorus (mg/L)	365.3	48 hours	0.03
Total Phosphorus (mg/L)	365.3	28 days	0.03
Turbidity (NTU)	180.1	48 hours	0.05
Total Suspended Solids (mg/L)	160.2	7 days	1.0
Total Dissolved Solids (mg/L)	160.1	7 days	1.0
Volatile Suspended Solids (mg/L)	160.4	7 days	2.0
Total Organic Carbon (mg/L)	415.1	28 days	1.0
Total Recoverable Petroleum Hydrocarbon (mg/L)	1664	28 days	5.0
Biochemical Oxygen Demand (mg/L)	405.1	48 hours	5.0
Chemical Oxygen Demand (mg/L)	410.1	28 days	10
Total Ammonia-Nitrogen (mg/L)	350.2	28 days	0.1
Total Kjeldahl Nitrogen (mg/L)	351.3	28 days	0.1
Nitrite Nitrogen (mg/L)	300.0	48 hours	0.1
Nitrate Nitrogen (mg/L)	300.0	48 hours	0.1
Alkalinity, as $CaCO_3$ (mg/L)	310.1	48 hours	2.0
Specific Conductance (umhos/cm)	120.1	48 hours	1.0
Total Hardness (mg/L)	130.2	180 days	2.0
MBAS (mg/L)	425.1	48 hours	0.5
Chloride (mg/L)	300.0	48 hours	2.0
Fluoride (mg/L)	300.0	48 hours	0.1
Sulfate (mg/L)	300.0	48 hours	2
Methyl tertiary butyl ether (MTBE) (µg/L)	8020A	14 days	1.0
BACTERIA (MPN/100ml)			
Total Coliform	SM 9221B	6 hours	<20
Fecal Coliform	SM 9221B	6 hours	<20
Fecal Streptococcus	SM 9221B	6 hours	<20
TOTAL METALS (µg/L)			
Aluminum	200.8	180 days	25
Arsenic	200.8	180 days	0.5
Beryllium	200.8	180 days	1
Cadmium	200.8	180 days	0.2
Chromium	200.8	180 days	1
Copper	200.8	180 days	1
Hexavalent Chromium	SM 3500D	24 hours	10
Iron	236.1	180 days	25
Lead	200.8	180 days	1
Mercury	245.1	28 days	0.2
Nickel	200.8	180 days	2
Zinc	200.8	180 days	5

Table 4.2. Continued.

Analyte and Reporting Unit	EPA Method Number	Holding Time	Target Reporting Limit
DISSOLVED METALS (µg/L)			
Aluminum	200.8	180 days *	25
Arsenic	200.8	180 days *	0.5
Beryllium	200.8	180 days *	1
Cadmium	200.8	180 days *	0.2
Chromium	200.8	180 days *	1
Copper	200.8	180 days *	1
Iron	236.1	180 days *	25
Lead	200.8	180 days *	1
Mercury	245.1	28 days *	0.2
Nickel	200.8	180 days *	2
Zinc	200.8	180 days *	5
CHLORINATED PESTICIDES (µg/L)			
Aldrin	8081A	7 days	0.05
Alpha-BHC	8081A	7 days	0.05
beta-BHC	8081A	7 days	0.05
Delta-BHC	8081A	7 days	0.05
gamma-BHC (lindane)	8081A	7 days	0.05
Alpha-Chlordane	8081A	7 days	0.50
gamma-Chlordane	8081A	7 days	0.50
4,4'-DDD	8081A	7 days	0.05
4,4'-DDE	8081A	7 days	0.05
4,4'-DDT	8081A	7 days	0.05
Dieldrin	8081A	7 days	0.10
Endosulfan I	8081A	7 days	0.05
Endosulfan II	8081A	7 days	0.05
Endosulfan sulfate	8081A	7 days	0.10
Endrin	8081A	7 days	0.10
Endrin Aldehyde	8081A	7 days	0.10
Endrin Ketone	8081A	7 days	0.10
Heptachlor	8081A	7 days	0.05
Heptachlor Epoxide	8081A	7 days	0.05
Methoxychlor	8081A	7 days	0.50
Toxaphene	8081A	7 days	1.00
Total PCBs	8081A	7 days	1.00
CARBAMATE & UREA PESTICIDES (µg/L)			
Oxamyl	632/632M	7 days	2.0
Methomyl	632/632M	7 days	2.0
Fenuron	632/632M	7 days	2.0
Monuron	632/632M	7 days	2.0
Propoxur	632/632M	7 days	2.0
Carbofuran	632/632M	7 days	4.0
Carbaryl	632/632M	7 days	2.0
Flumeturon	632/632M	7 days	2.0
Diuron	632/632M	7 days	2.0
Propham	632/632M	7 days	2.0
Siduron	632/632M	7 days	2.0
Methiocarb	632/632M	7 days	4.0
Linuron	632/632M	7 days	2.0
Swep	632/632M	7 days	2.0

Table 4.2. Continued.

Analyte and Reporting Unit	EPA Method Number	Holding Time	Target Reporting Limit
Chlorpropham	632/632M	7 days	2.0
Brabane	632/632M	7 days	2.0
Neburon	632/632M	7 days	2.0
AROCLORS (µg/L)			
Aroclor-1016	8081A	7 days	1.0
Aroclor-1221	8081A	7 days	1.0
Aroclor-1232	8081A	7 days	1.0
Aroclor-1242	8081A	7 days	1.0
Aroclor-1248	8081A	7 days	1.0
Aroclor-1254	8081A	7 days	1.0
Aroclor-1260	8081A	7 days	1.0
ORGANOPHOSPHATE PESTICIDES (µg/L)			
Azinphos methyl	8141A	7 days	0.05-1.0
Bolstar	8141A	7 days	0.05-1.0
Coumaphos	8141A	7 days	0.05-1.0
Demeton O & S	8141A	7 days	0.05-1.0
Diazinon	8141A	7 days	0.05
Dicholorvoz	8141A	7 days	0.05-1.0
Disulfoton	8141A	7 days	0.05-1.0
Dursban (chlorpyrifos)	8141A	7 days	1.0
Ethoprop	8141A	7 days	0.05-1.0
Fensulfothion	8141A	7 days	0.05-1.0
Fenthion	8141A	7 days	0.05-1.0
Merphos	8141A	7 days	0.05-1.0
Malathion	8141A	7 days	1.0
Mevinphos	8141A	7 days	0.05-1.0
Parathion methyl	8141A	7 days	0.05-1.0
Phorate	8141A	7 days	0.05-1.0
Ronnel	8141A	7 days	0.05-1.0
Stirophos	8141A	7 days	0.05-1.0
Tokuthion	8141A	7 days	0.05-1.0
Tricholronate	8141A	7 days	0.05-1.0
Prometryn	8141A	7 days	1.0
Atrazine	8141A	7 days	1.0
Simazine	8141A	7 days	1.0
Cyanazine	8141A	7 days	1.0
HERBICIDES (µg/L)			
Dalapon	8151A	7 days	5.0
Dicamba	8151A	7 days	0.5
MCPP	8151A	7 days	100
MCPA	8151A	7 days	100
Dichlorprop	8151A	7 days	1.0
2,4-D	8151A	7 days	1.0
2,4,5-TP-Silvex	8151A	7 days	5.0
2,4,5-T	8151A	7 days	5.0
2,4-DB	8151A	7 days	5.0
Dinoseb	8151A	7 days	5.0
Bentazon	515.1	7 days	1.0

Table 4.2. Continued.

Analyte and Reporting Unit	EPA Method Number	Holding Time	Target Reporting Limit
Acenaphthylene	625	7 days	1.0
Acetophenone	625	7 days	3.0
Aniline	625	7 days	3.0
Anthracene	625	7 days	1.0
4-Aminobiphenyl	625	7 days	3.0
Benzidine	625	7 days	10.0
Benzo(a)anthracene	625	7 days	1.0
Benzo(b)fluoranthene	625	7 days	1.0
Benzo(k)fluoranthene	625	7 days	1.0
Benzo(a)pyrene	625	7 days	1.0
Benzyl butyl phthalate	625	7 days	3.0
Bis(2-chloroethyl)ether	625	7 days	1.0
is(2-chloroethoxv)methane	625	7 davs	1.0
Bis(2-ethylhexyl)phthalate	625	7 days	3.0
Bis(2-chlorisopropyl)ether	625	7 days	1.0
4-Bromophenyl phenyl ether	625	7 days	1.0
4-Chloroaniline	625	7 days	1.0
1-Chloronaphthalene	625	7 days	1.0
2-Chloronaphthalene	625	7 days	1.0
4-Chlorophenyl phenyl ether	625	7 days	1.0
Chrysene	625	7 days	1.0
p-Dimethylaminoazobenzene	625	7 days	3.0
7,12-Dimethylbenz(a)-anthracene	625	7 days	1.0
a-,a-Dimethylphenethylamine	625	7 days	3.0
Dibenz(a,j)acridine	625	7 days	3.0
Dibenz(a,h)anthracene	625	7 days	1.0
1,3-Dichlorobenzene	625	7 days	1.0
1,2-Dichlorobenzene	625	7 days	1.0
1,4-Dichlorobenzene	625	7 days	1.0
3,3-Dichlorobenzidine	625	7 days	3.0
Diethyl phthalate	625	7 days	1.0
Dimethyl phthalate	625	7 days	1.0
Di-n-butylphthalate	625	7 days	3.0
2,4-Dinitrotoluene	625	7 days	1.0
2,6-Dinitrotoluene	625	7 days	1.0
Diphenylamine	625	7 days	3.0
1,2-Diphenylhydrazine	625	7 days	3.0
Di-n-octylphthalate	625	7 days	3.0
Ethyl methanesulfonate	625	7 days	3.0
Endrin ketone	625	7 days	1.0
Fluoranthene	625	7 days	1.0
Fluorene	625	7 days	1.0
Hexachlorobenzene	625	7 days	1.0
Hexachlorobutadiene	625	7 days	1.0
Hexachlorocyclopentadiene	625	7 days	3.0
Hexachloroethane	625	7 days	1.0
Indeno[1,2,3-cd]pyrene	625	7 days	1.0
Isophorone	625	7 days	1.0
3-Methylcholanthrene	625	7 days	3.0
Methyl methanesulfonate	625	7 days	3.0
Naphthalene	625	7 days	1.0

Table 4.2. Continued			
Analyte and Reporting Unit	**EPA Method Number**	**Holding Time**	**Target Reporting Limit**
1-Naphthylamine	625	7 days	3.0
2-Naphthylamine	625	7 days	3.0
2-Nitroaniline	625	7 days	3.0
3-Nitroaniline	625	7 days	3.0
4-Nitroaniline	625	7 days	3.0
Nitrobenzene	625	7 days	1.0
N-Nitrosodimethylamine	625	7 days	3.0
N-Nitrosodiphenylamine	625	7 days	3.0
N-Nitroso-di-n-propylamine	625	7 days	1.0
N-Nitrosopiperidine	625	7 days	3.0
Pentachlorobenzene	625	7 days	3.0
Phenacitin	625	7 days	3.0
Phenanthrene	625	7 days	1.0
2-Picoline	625	7 days	3.0
Pronamide	625	7 days	5.0
Pyrene	625	7 days	1.0
1,2,4,5-Tetrachlorobenzene	625	7 days	3.0
1,2,4-Trichlorobenzene	625	7 days	1.0
Benzoic Acid	625	7 days	10.0
Benzyl Alcohol	625	7 days	5.0
4-Chloro-3-methylphenol	625	7 days	3.0
2-Chlorophenol	625	7 days	2.0
2,4-Dichlorophenol	625	7 days	2.0
2,6-Dichlorophenol	625	7 days	2.0
2,4-Dimethylphenol	625	7 days	2.0
2,4-Dinitrophenol	625	7 days	3.0
2-Methyl-4,6-dinitrophenol	625	7 days	3.0
2-Methylphenol	625	7 days	3.0
4-Methylphenol	625	7 days	3.0
2-Nitrophenol	625	7 days	3.0
4-Nitrophenol	625	7 days	3.0
Pentachlorophenol	625	7 days	2.0
Phenol	625	7 days	1.0
2,3,4,6-Tetrachlorophenol	625	7 days	1.0
2,4,5-Trichlorophenol	625	7 days	1.0
2,4,6-Trichlorophenol	625	7 days	1.0

SM = Method number from *Standard Methods for the Exmaination of Water and Wastewater* (APHA 1995).
* Samples must be filtered within 48 hours.

4.5.2 Toxicity Testing Procedures

Upon receipt in the laboratory, storm water discharge and receiving water samples were stored at 4 °C, in the dark until used in toxicity testing. Toxicity testing commenced within 72 hours of sample collection for most samples (Appendix Table A2-2). The relative toxicity of each discharge sample was evaluated using three chronic test methods: the water flea (*Ceriodaphnia dubia*) reproduction and survival test (freshwater), the purple sea urchin (*Strongylocentrotus purpuratus*) fertilization test (marine), and the mysid (*Americamysis bahia*) growth and survival test (marine). ToxScan, Inc. conducted the freshwater toxicity tests using the water flea, *Ceriodaphnia dubia*, while the marine toxicty tests of the purple sea urchin (*Strongylocentrotus purpuratus*) and the mysid (*Americamysis bahia*) were conducted by SCCWRP. Each of the methods is recommended by the USEPA for the measurement of effluent and receiving water toxicity. Samples of marine receiving water from Alamitos Bay were tested with the two marine species only. Water samples were diluted with laboratory water to produce a concentration series using procedures specific to each test method.

4.5.2.1 Water Flea Reproduction and Survival Test

Toxicity tests using the water flea, *Ceriodaphnia dubia*, were conducted in accordance with methods recommended by USEPA (1994a). The test procedure consisted of exposing 10 *C. dubia* neonates (less than 24 hours old) to the samples for six days. One animal was placed in each of 10 individual polystyrene cups containing approximately 20 mL of test solution. The test temperature was 25 ± 1 °C and the photoperiod was 16 hours light: 8 hours dark. Daily water changes were accomplished by transferring each individual to a fresh cup of test solution; water quality measurements and observations of survival and reproduction (number of offspring) were made at this time also. Prior to transfer, each cup was inoculated with food (100 µL of a 3:1 mixture of *Selenastrum* culture, density approximately 3.5×10^8 cells/mL, and *Ceriodaphnia* chow).

The test organisms were obtained from in-house cultures that were established from broodstock obtained from USEPA (Duluth, MN). The laboratory water used for cultures, controls, and preparation of sample dilutions was synthetic moderately hard freshwater, prepared with deionized water and reagent chemicals. Test samples were poured through a 60 µm Nitex screen in order to remove indigenous organisms prior to preparation of the test concentrations. Serial dilutions of the test sample were prepared, resulting in test concentrations of 100, 50, 25, 12, and 6 %.

The quality assurance program for this test consisted of three components. First, a control sample (laboratory water) was included in all tests in order to document the health of the test organisms. Second, a reference toxicant test consisting of a concentration series of potassium chloride (KCl) was conducted with each batch of samples to evaluate test sensitivity and precision. Third, the results were compared to established performance criteria for control survival, reproduction, reference toxicant sensitivity, sample storage, and test conditions. Any deviations from the performance criteria were noted in the laboratory records and prompted corrective action, ranging from a repeat of the test to adjustment of laboratory equipment.

4.5.2.2 Mysid Growth and Survival Test

Samples of wet weather discharge and receiving water were assessed for chronic toxicity using the marine mysid, *Americamysis bahia* (formerly named *Mysidopsis bahia*). Test procedures followed the guidelines established by USEPA (1994b). The procedure consisted of a seven-day exposure of juvenile (7 day old) mysids to the samples. Eight replicate test chambers (250 mL beakers), each containing five mysids, were tested for each concentration. The beakers contained 150 mL of test solution, which was changed daily. The test temperature was 26 ± 1 °C and the photoperiod was 16 hours light: 8 hours dark. Water quality and mysid survival measurements were recorded during each water change. Mysids were fed a standardized amount of newly hatched brine shrimp twice daily. At the end of the test, the surviving animals were dried and weighed to the nearest 0.001 mg to determine effects on growth.

The discharge water samples were adjusted to a salinity of 30 g/kg before testing. This was accomplished by adding a sea salt mixture (Forty Fathoms Bioassay Laboratory Formula) to the samples. The addition of sea salts was carried out the day before a test was initiated. The receiving water samples from Alamitos Bay had salinities greater than 30 g/kg and were tested without adjustment of the salinity. The salinity-adjusted samples were then diluted with seawater to produce test concentrations of 100, 50, 25, 12, and 6%. The test organisms were lab-reared *A. bahia* that were purchased from a commercial supplier. For most of the tests, the animals were received the day before the test started and were acclimated to the test temperature and salinity overnight.

Negative control (0.45 µm and activated carbon filtered natural seawater from Redondo Beach diluted to 30 g/kg with deionized water) and sea salt control samples (deionized water mixed with sea salts) were included in each test series for quality control purposes. In addition, a reference toxicant test was included with each batch of test samples. Each reference toxicant test consisted of a concentration series of copper chloride with eight replicates tested per concentration. The median lethal concentration (LC50) was calculated from the data and compared to control limits based upon the cumulative mean and two standard deviations from recent experiments. Control and water quality data were also compared to established performance objectives; any deviations from these were noted and corrected, if possible.

4.5.2.3 Sea Urchin Fertilization Test

All discharge and receiving water samples of storm water were also evaluated for toxicity using the purple sea urchin fertilization test (U. S. Environmental Protection Agency 1995). This test measures toxic effects on sea urchin sperm, which are expressed as a reduction in their ability to fertilize eggs. The test consisted of a 20 minute exposure of sperm to the samples. Eggs were then added and given 20 minutes for fertilization to occur. The eggs were then preserved and examined later with a microscope to assess the percentage of successful fertilization. Toxic effects are expressed as a reduction in fertilization percentage. Purple sea urchins (*Strongylocentrotus purpuratus*) used in the tests were collected from the intertidal zone in northern Santa Monica Bay. The tests were conducted in glass shell vials containing 10 mL of solution at a temperature of 15 ± 1 °C. Five replicates were tested at each sample concentration.

All samples were adjusted to a salinity of 33.5 g/kg for the fertilization test. Previous experience has determined that many sea salt mixes are toxic to sea urchin sperm. Therefore, the salinity for the urchin test was adjusted by the addition of hypersaline brine. The brine was prepared by freezing and partially thawing seawater. Since the addition of brine dilutes the sample, the highest storm water concentration that could be tested for the sperm cell test was 50%. The adjusted samples were diluted with seawater to produce test concentrations of 50, 25, 12, 6, and 3%.

Seawater control (0.45 µm and activated carbon filtered natural seawater from Redondo Beach) and brine control samples (50% deionized water and 50% brine) were included in each test series for quality control purposes. Water quality parameters (temperature, dissolved oxygen, pH, ammonia, and salinity) were measured on the test samples to ensure that the experimental conditions were within desired ranges and did not create unintended stress on the test organisms. In addition, a reference toxicant test was included with each storm water test series in order to document intralaboratory variability. Each reference toxicant test consisted of a concentration series of copper chloride with five replicates tested per concentration. The median effective concentration (EC50) was estimated from the data and compared to control limits based upon the cumulative mean and two standard deviations of recent experiments.

4.5.2.4 Toxicity Identification Evaluations (TIEs)

Phase I TIEs were conducted on selected runoff samples from stations that exhibited consistent toxicity, in order to determine the characteristics of the toxicants present. Each sample was subjected to treatments designed to selectively remove or neutralize classes of compounds (e.g., metals, nonpolar organics) and thus the toxicity that may be associated with them. Treated samples were then tested to determine the change in toxicity using the sea urchin fertilization test.

Four treatments were applied to each sample. These treatments were: particle removal, trace metal chelation, nonpolar organic extraction, and chemical reduction. With the exception of the organics extraction, each treatment was applied independently on a salinity-adjusted sample. A control sample (lab dilution water) was included with each type of treatment to verify that the manipulation itself was not causing toxicity. If the TIE was not conducted concurrently with the initial testing of a sample, then reduced set of concentrations of untreated sample were tested at the time of the TIE to determine the baseline toxicity and control for changes in toxicity due to sample storage.

Ethylenediaminetetraacetic acid (EDTA), a chelator of metals, was added to a concentration of 60 mg/L to the test samples. Sodium thiosulfate (STS), a treatment that reduces oxidants such as chlorine and also decreases the toxicity of some metals was added to a concentration of 50 mg/L to separate portions of each sample. The EDTA and sodium thiosulfate treatments were given at least one hour to interact with the sample prior to the start of toxicity testing.

Samples were centrifuged for 30 min at 3000 X g to remove particle-borne contaminants and tested for toxicity. A portion of the centrifuged sample was also passed through a 6 mL Varian Mega Bond Elut C18 solid phase extraction column in order to remove nonpolar organic compounds. C-18 columns have also been found to remove some metals from aqueous solutions.

4.5.2.5 Statistical Analysis

The toxicity test results were normalized to the control response in order to facilitate comparisons of toxicity between experiments. Normalization was accomplished by expressing the test responses as a percentage of the control value. Four statistical parameters (NOEC, LOEC, median effect, and TUc) were calculated to describe the magnitude of storm water toxicity. The

NOEC (highest test concentration not producing a statistically significant reduction in fertilization or survival) and LOEC (lowest test concentration producing a statistically significant reduction in fertilization or survival) were calculated by comparing the response at each concentration to the dilution water control. Various statistical tests were used to make this comparison, depending upon the characteristics of the data. Water flea survival and reproduction data were usually tested against the control using Fisher's Exact and Steel's Many-One Rank test, respectively. Sea urchin fertilization and mysid survival data were evaluated for significant differences using Dunnett's multiple comparison test, provided that the data met criteria for homogeneity of variance and normal distribution. Data that did not meet these criteria were analyzed by the non-parametric Steel's Many-One Rank or Wilcoxon's tests.

Measures of median effect for each test were calculated as the LC50 (concentration producing a 50% reduction in survival) for mysid and water flea survival, the EC50 (concentration effective on 50% of eggs) for sea urchin fertilization, or the IC50 (concentration inhibitory to 50% of individuals) for water flea reproduction and IC25 for mysid growth. The LC50 or EC50 was calculated using either probit analysis or the trimmed Spearman-Karber method. The IC25 and IC50 were calculated using linear interpolation analysis. All procedures for calculation of median effects followed USEPA guidelines.

The toxicity results were also expressed as chronic Toxic Units (TUc). This statistic was calculated as: 100/NOEC. Increased values of toxic units indicate relatively greater toxicity, whereas greater toxicity for the NOEC, LOEC, and median effect statistics is indicated by a lower value.

Comparisons of chemical or physical parameters with toxicity results were made using the non-parametric Spearman rank order correlation.

5.0 HYDROLOGY

Operation of the Long Beach monitoring stations began immediately after installation of the storm water monitoring equipment. Equipment installations were completed at the end of January 2001. An attempt was made to monitor four events at all sites during the 2000-2001 wet weather season. In actuality, only three events were monitored at the Dominguez Gap Pump Station due to the lack of discharge flow at this station. Four events were achieved at the Belmont Pump Station and Bouton Creek, and a fifth event was monitored at Los Cerritos Creek due to a poor storm capture during one of the previous events.

5.1 Precipitation During the 2000-2001 Storm Season

Precipitation during the 2000-2001 water year was above normal in Long Beach according to the National Weather Service climate station at Long Beach Airport (Figure 5.1). A total of 13.32 inches of rain was recorded at the Long Beach Airport between October 1, 2000 and April 30, 2001. Since 1953, the average seasonal precipitation at the Long Beach Airport for the same period is 11.74 inches.

5.1.1 Monthly Precipitation

January and February 2001 were the wettest months of the storm season (Figure 5.1). These two months accounted for more than two-thirds of the season's total precipitation. November and December were the driest months of the water year with only trace precipitation for the period. Interestingly, nearly ten-times the normal precipitation occurred in October of 2000.

For the period in which rain gauges were activated at the monitoring stations (February through April, 2001), the Belmont pump station received the most precipitation with 9.11 inches of rain followed by Bouton Creek with 8.91 inches. The most inland station, Dominguez Gap, received the least rainfall (7.09 inches).

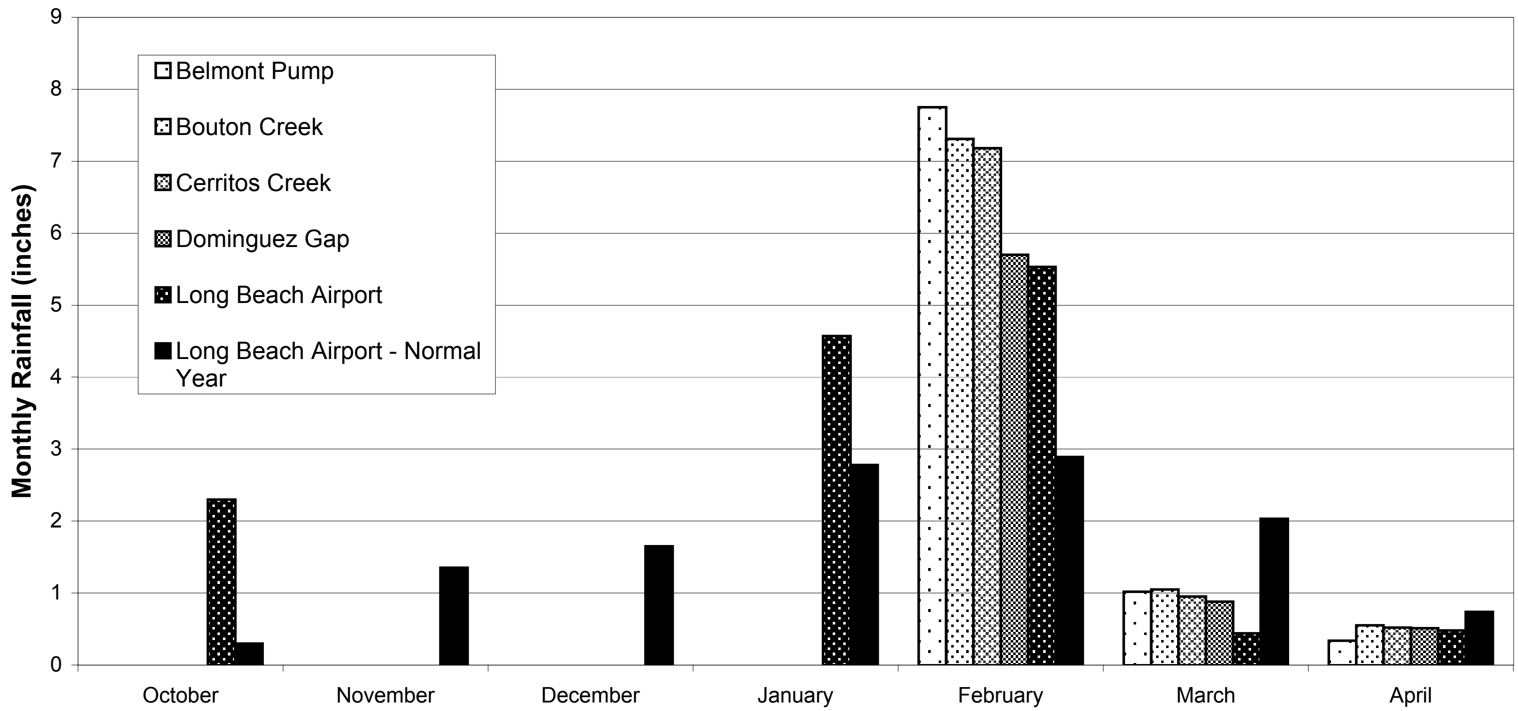
5.1.2 Precipitation During Monitored Events

Precipitation during each storm event was characterized by total rainfall, duration of rainfall, maximum intensity, days since last rainfall, and the magnitude of the event immediately preceding the monitored storm event (antecedent rainfall). Precipitation characteristics for each event are summarized in Table 5.1. Descriptive statistics for each monitoring station are presented in Table 5.2. Cumulative rainfall is summarized graphically for each monitored event at each station in Figures 5.2 through 5.17.

A variety of storm conditions were monitored at most sites from January through April 2001. Except for Event 1 on 26 January 2001at all stations, and Event 4 on 24 February 2001 at the Belmont Pump Station, all storm events monitored were spaced by at least 3 days of rainfall less than 0.1 inches. The first event was preceded by 0.13 to 0.27 inches of rainfall 1.8 days earlier. The fourth event at the Belmont Pump Station was preceded by 0.28 inches of rainfall 1.1 days earlier. The 28 days preceding the sixth event on April 7, 2001 was the driest period prior to a monitored event. Overall, the mean period of dry conditions between monitored events ranged from 7.4 days at the Dominguez Gap Pump Station to 17.0 days at Bouton Creek.

Event 4 on 23 through 25 February 2001 had the most rainfall with 2.68 inches at the Dominguez Gap Pump Station and 0.93 inches at the Belmont Pump Station. The second event

Figure 5.1. Monthly Rainfall Totals for the 2000-2001 Storm Season



	Belmont Pump	Bouton Creek	Cerritos Creek	Dominguez Gap	Long Beach Airport	Long Beach Airport - Normal Year
October	*	*	*	*	2.3	0.3
November	*	*	*	*	0	1.35
December	*	*	*	*	0	1.65
January	*	*	*	*	4.57	2.78
February	7.75	7.31	7.18	5.7	5.53	2.89
March	1.02	1.05	0.95	0.88	0.44	2.03
April	0.34	0.55	0.52	0.51	0.48	0.74
Season Total	n/a	n/a	n/a	n/a	13.32	11.74

* = Data not available; stations installed in mid January.
n/a = not applicable.

Table 5.1. Rainfall For Monitoring Events During the 2000-2001 Wet-Weather Season

Site/Event	Start Rain Date	Start Rain Time	End Rain Date	End Rain Time	Duration Rain (hours:minutes)	Total Rain (inches)	Max Intensity (Inches/hr)	Antecedent Rain (days)	Antecedent Rain (inches)
Event 1									
BOUTON CREEK	1/26/2001	600	1/26/2001	2110	15:10	0.74	1.2	NA	NA
LOS CERRITOS CHANNEL	NA	NA	1/26/2001	2055	NA	0.60	0.6	1.8	0.13
Event 2									
BELMONT PUMP ST.	2/10/2001	505	2/10/2001	845	3:40	0.50	1.2	13.8	0.70
BOUTON CREEK	2/10/2001	520	2/10/2001	1900	13:40	0.34	0.48	14.3	0.74
LOS CERRITOS CHANNEL	2/10/2001	555	2/10/2001	1900	13:05	0.28	0.36	14.4	0.60
DOMINGUEZ GAP PUMP ST.	2/10/2001	440	2/12/2001	441	48:01	2.11	0.36	13.9	0.39
Event 3									
BELMONT PUMP ST.	2/23/2001	645	2/23/2001	900	2:15	0.28	0.84	9.4	2.39
BOUTON CREEK	2/23/2001	645	2/25/2001	640	47:55	0.89	0.48	8.7	3.05
LOS CERRITOS CHANNEL	2/23/2001	620	2/23/2001	900	2:40	0.25	0.84	3.5	0.11
Event 4									
BELMONT PUMP ST.	2/24/2001	1055	2/25/2001	615	19:20	0.93	0.24	1.1	0.28
DOMINGUEZ GAP PUMP ST.	2/23/2001	755	2/26/2001	600	70:05	2.68	0.84	8.9	2.48
Event 5									
DOMINGUEZ GAP PUMP ST.	3/5/2001	1320	3/6/2001	535	16:15	0.55	0.24	5.2	3.50
Event 6									
BELMONT PUMP ST.	4/7/2001	215	4/7/2001	1335	11:20	0.23	0.24	28	0.15
BOUTON CREEK	4/7/2001	125	4/9/2001	1220	58:55	0.37	0.36	28	0.22
LOS CERRITOS CHANNEL	4/7/2001	150	4/7/2001	1335	11:45	0.33	0.36	28	0.10
Event 7									
LOS CERRITOS CHANNEL	4/20/2001	2255	4/21/2001	835	9:40	0.19	0.6	13.4	0.33

NA = Not Available

Table 5.2 Descriptive Statistics for Rainfall and Flow Data During the 2000-2001 Wet-Weather Season

Site / Parameter	n	Missing Values	Min	Max	Mean	Standard Deviation	1st Quartile	Median	3rd Quartile
BELMONT PUMP ST.									
Duration Flow (days)	4	3	0.01	1.80	0.68	0.80	0.16	0.46	0.98
Total Storm Vol. (kcf)	4	3	50	331	134	131	65	79	148
Duration Rain (days)	5	2	0.09	1.17	0.54	0.45	0.15	0.47	0.81
Total Rain (in)	5	2	0.23	0.93	0.53	0.29	0.28	0.50	0.70
Max Intensity (in/hr)	5	2	0.24	1.20	0.60	0.42	0.24	0.48	0.84
Antecedent Dry (days)	5	2	1.11	28.00	10.82	10.97	1.80	9.40	13.80
Antecedent Rain (in)	5	2	0.13	2.39	0.73	0.96	0.15	0.28	0.70
BOUTON CREEK									
Duration Flow (days)	4	3	1.20	2.72	1.81	0.69	1.32	1.65	2.14
Total Storm Vol. (kcf)	4	3	640	2755	1458	953	803	1220	1875
Duration Rain (days)	4	3	0.57	2.45	1.41	0.96	0.62	1.31	2.11
Total Rain (in)	4	3	0.34	0.89	0.59	0.27	0.36	0.56	0.78
Max Intensity (in/hr)	4	3	0.36	1.20	0.63	0.38	0.45	0.48	0.66
Antecedent Dry (days)	3	4	8.70	28.00	17.00	9.93	11.50	14.30	21.15
Antecedent Rain (in)	3	4	0.22	3.05	1.34	1.51	0.48	0.74	1.90
CERRITOS CHANNEL									
Duration Flow (days)	4	3	0.43	0.74	0.58	0.13	0.52	0.57	0.62
Total Storm Vol. (kcf)	5	2	1582	4451	2993	1309	2251	2354	4330
Duration Rain (days)	4	3	0.11	0.55	0.39	0.19	0.33	0.45	0.50
Total Rain (in)	5	2	0.19	0.60	0.33	0.16	0.25	0.28	0.33
Max Intensity (in/hr)	5	2	0.36	0.84	0.55	0.20	0.36	0.60	0.60
Antecedent Dry (days)	5	2	1.80	28.00	12.22	10.49	3.50	13.40	14.40
Antecedent Rain (in)	5	2	0.10	0.60	0.25	0.22	0.11	0.13	0.33
DOMINGUEZ GAP									
Duration Flow (days)	3	4	0.12	1.72	0.72	0.87	0.22	0.32	1.02
Total Storm Vol. (kcf)	3	4	812	7528	3903	3389	2091	3370	5449
Duration Rain (days)	4	3	0.68	2.92	1.61	1.05	0.81	1.43	2.23
Total Rain (in)	4	3	0.39	2.68	1.43	1.14	0.51	1.33	2.25
Max Intensity (in/hr)	4	3	0.24	0.84	0.45	0.27	0.33	0.36	0.48
Antecedent Dry (days)	4	3	1.8	13.9	7.45	5.19	4.35	7.05	10.15
Antecedent Rain (in)	4	3	0.27	3.50	1.66	1.59	0.36	1.44	2.74

Figure 5.2 - Bouton Creek - Event 1 (26 January, 2001)

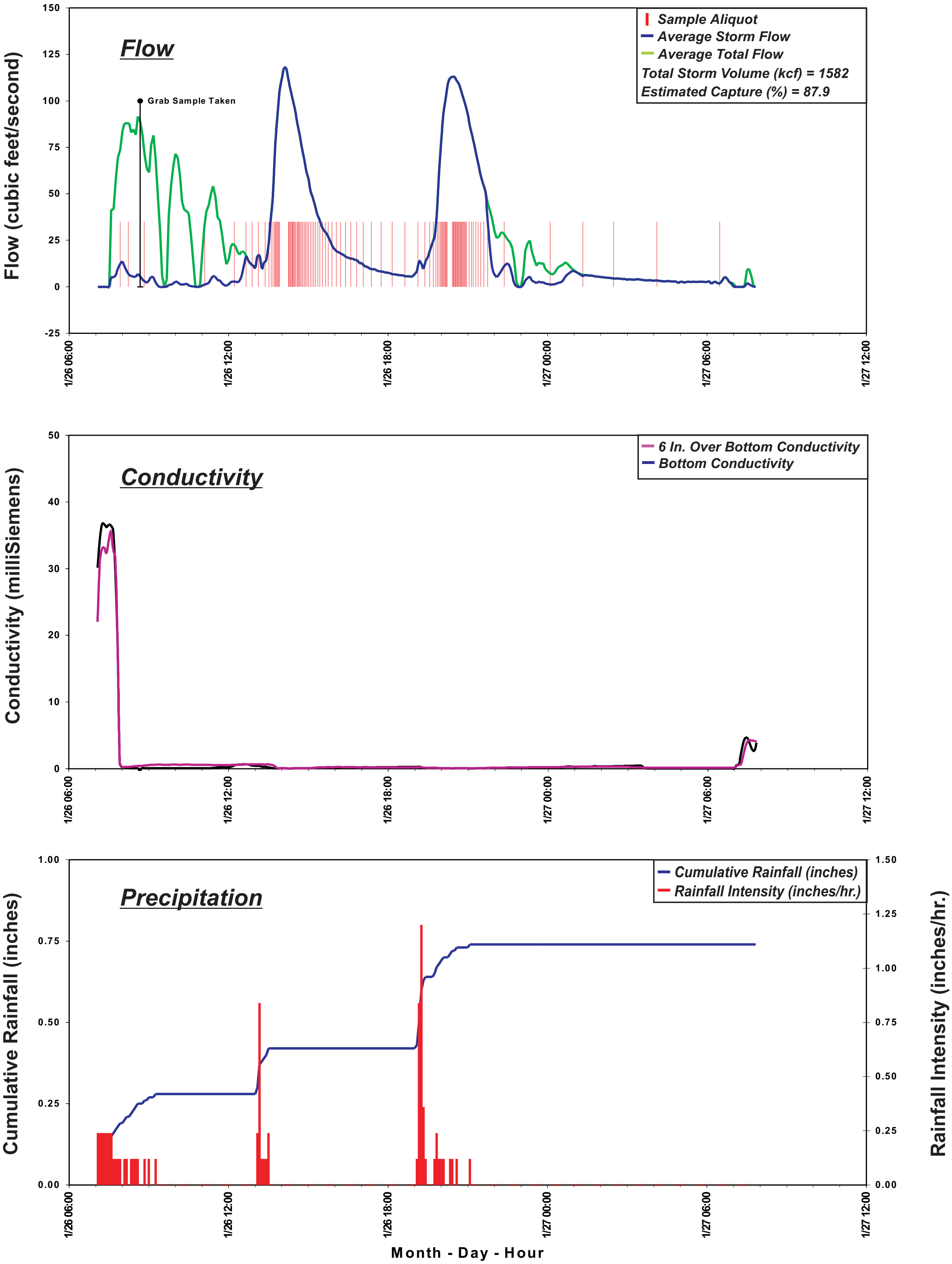
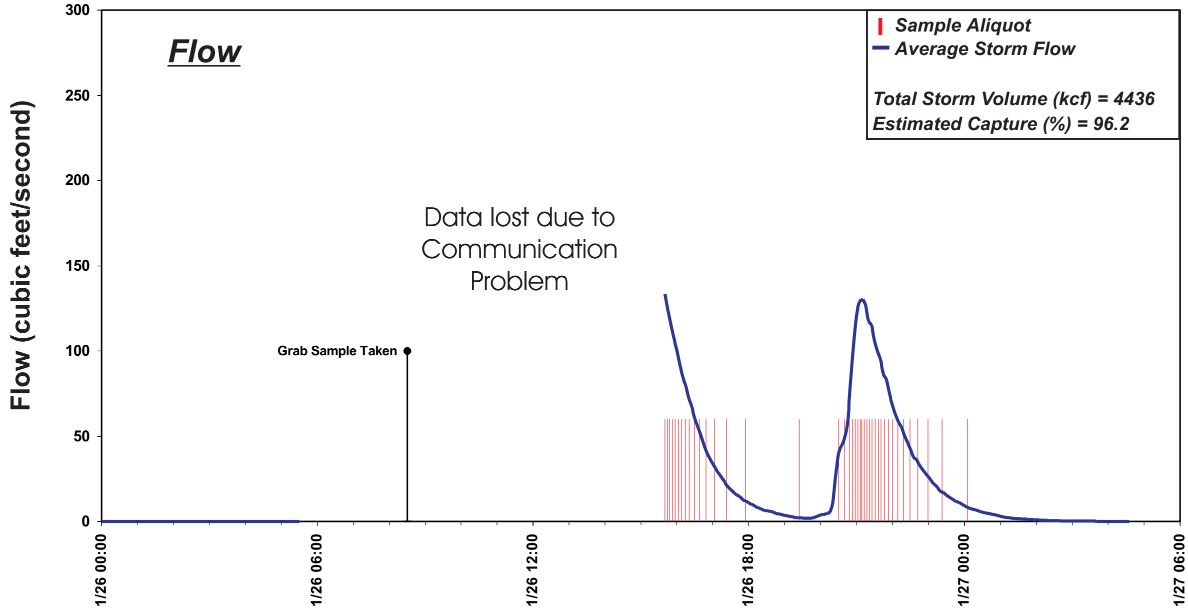


Figure 5.3 - Los Cerritos Channel - Event 1 (27 January, 2001)



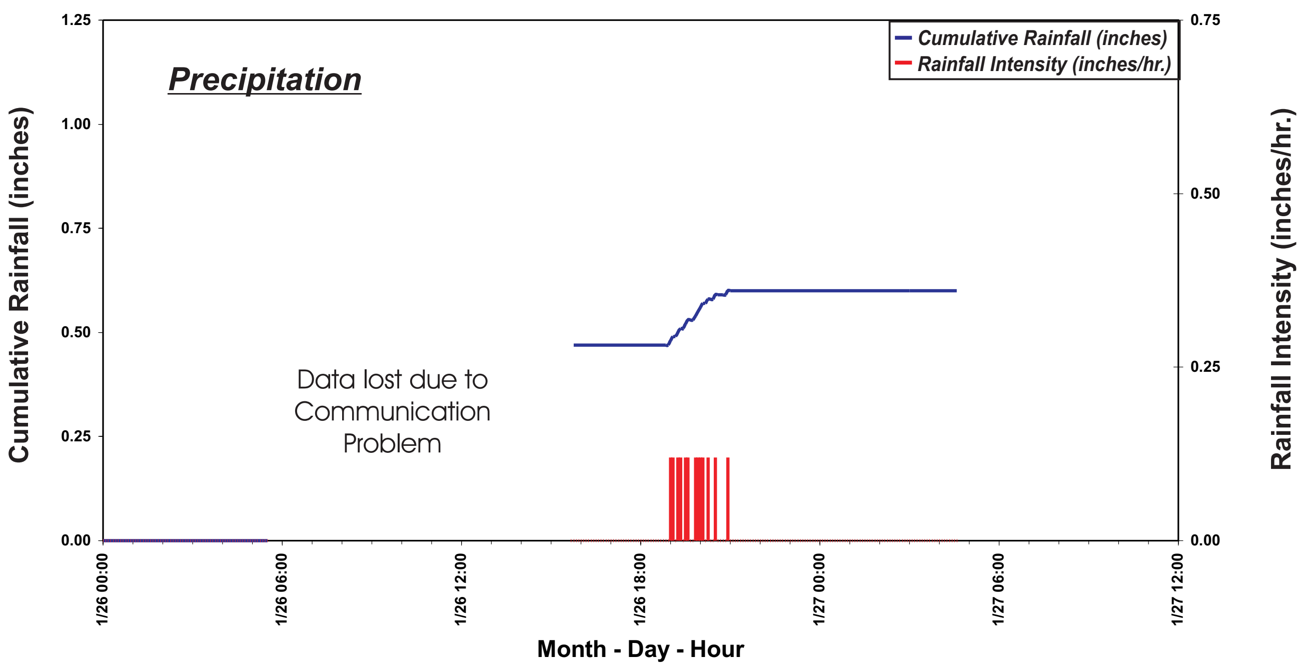
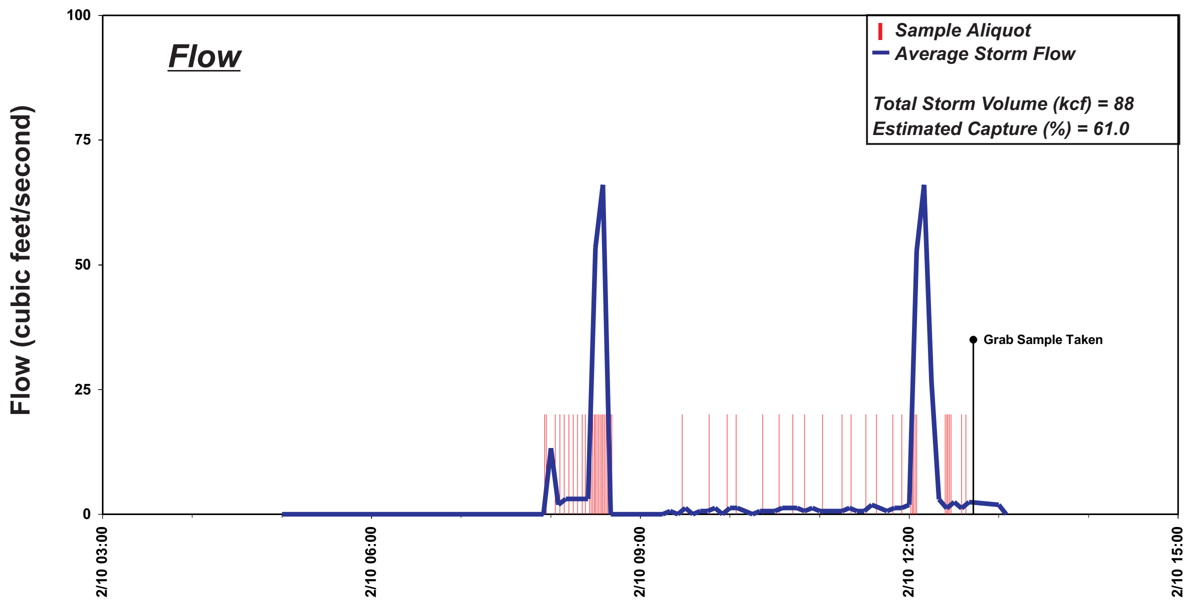


Figure 5.4 - Belmont Pump Station - Event 2 (10 February, 2001)



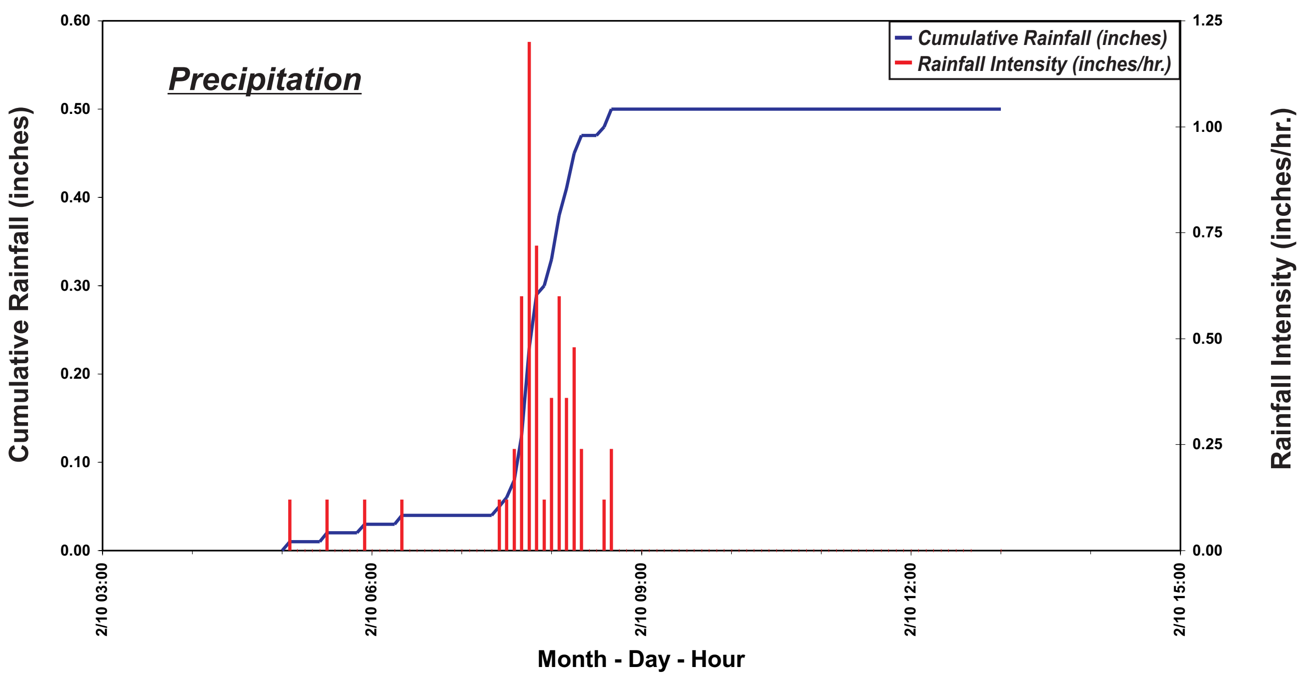


Figure 5.5 - Bouton Creek - Event 2 (10 February, 2001)

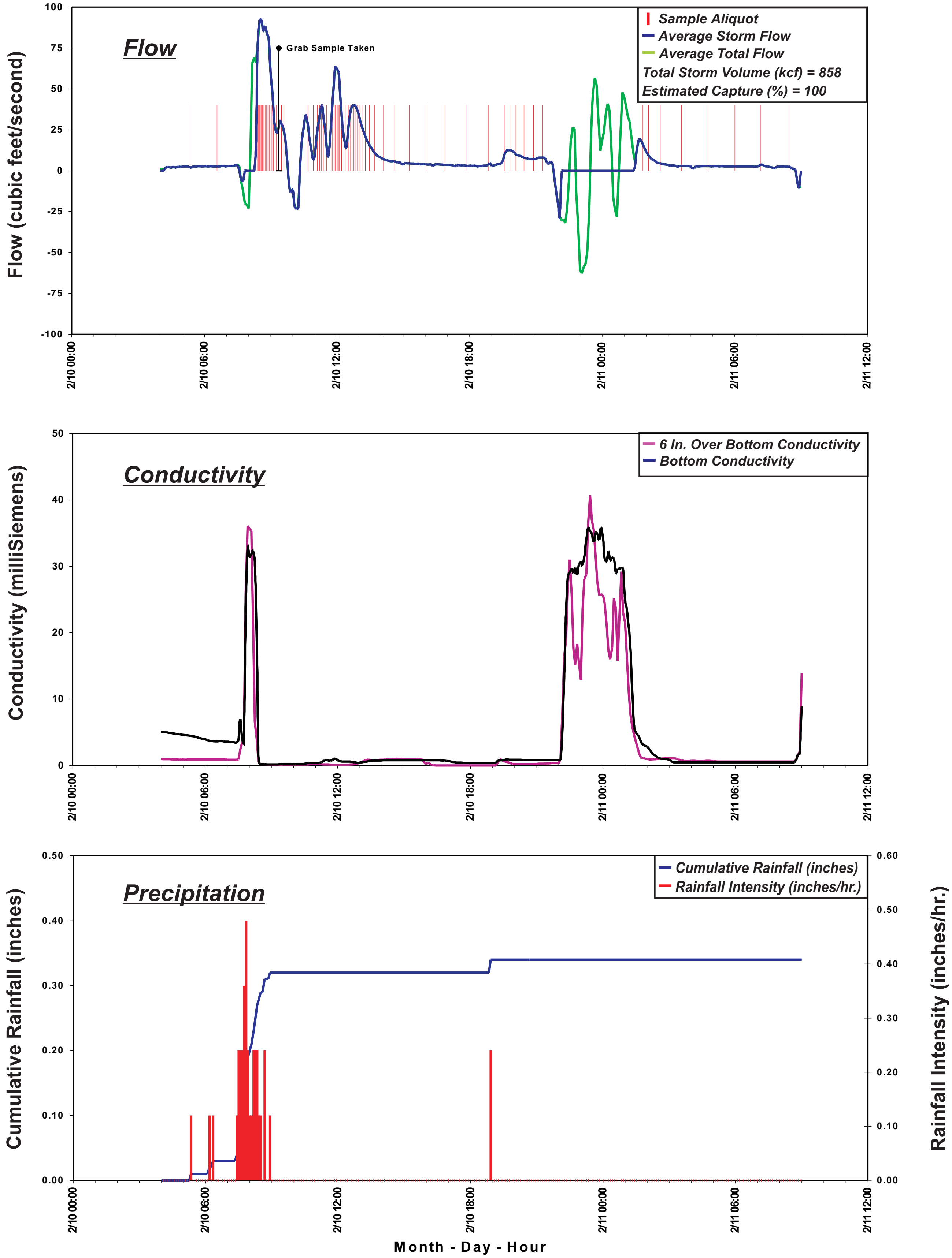
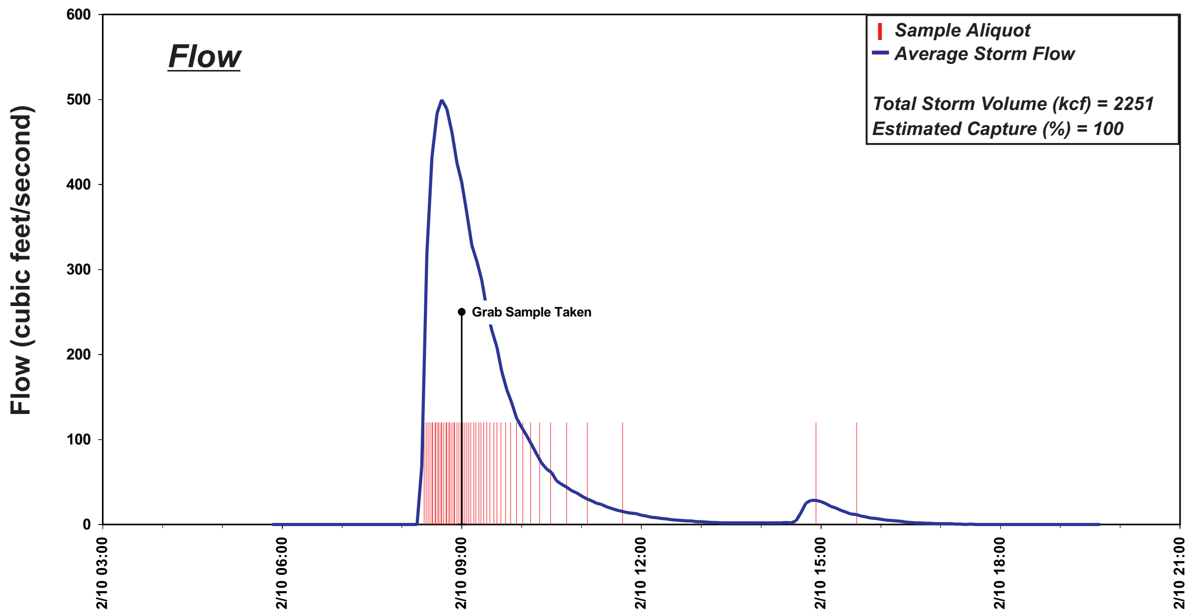


Figure 5.6 - Los Cerritos Channel - Event 2 (10 February, 2001)



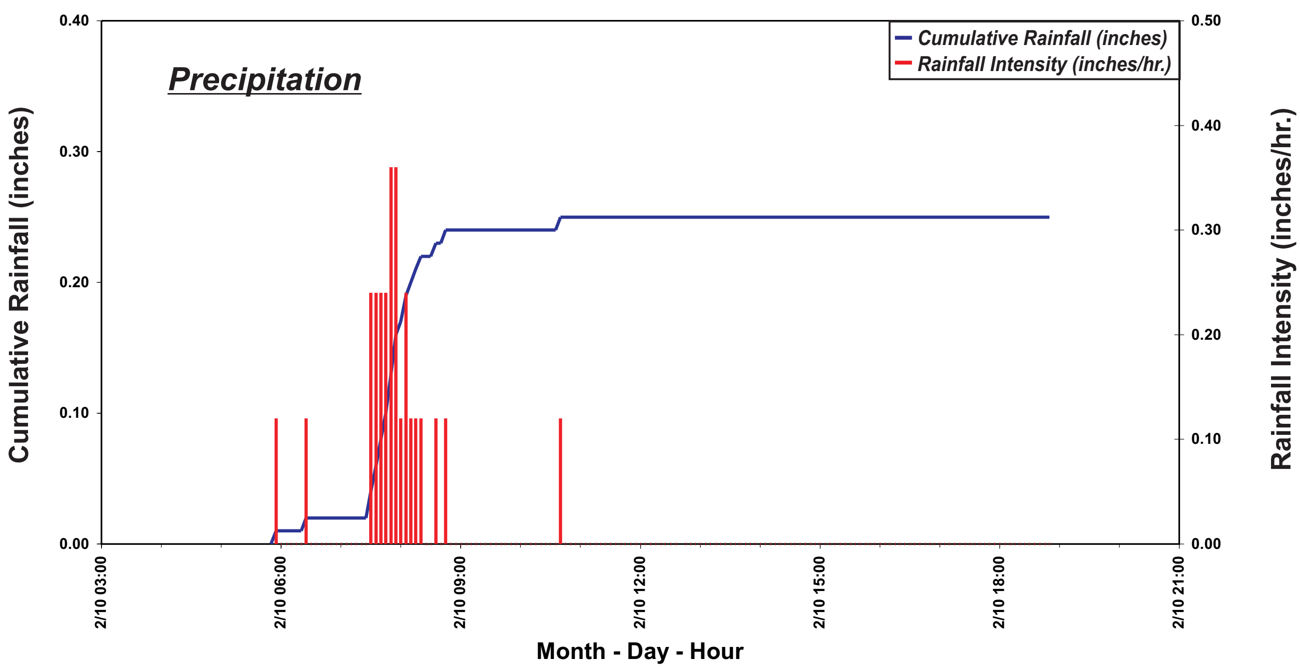
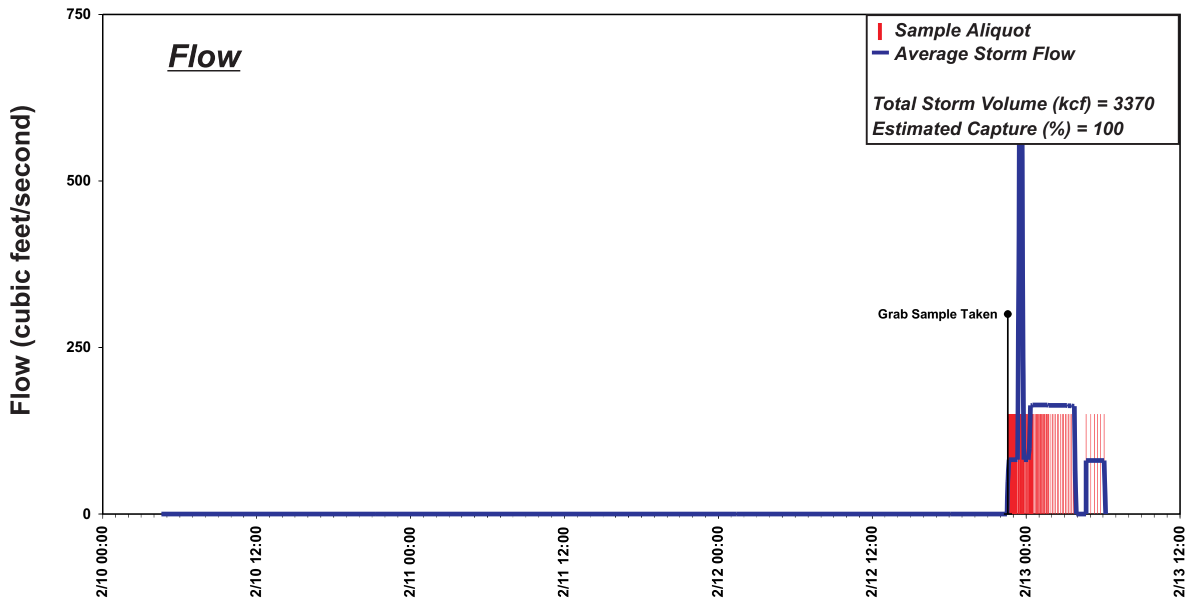


Figure 5.7 - Dominguez Gap Pump Station - Event 2 (10 February, 2001)



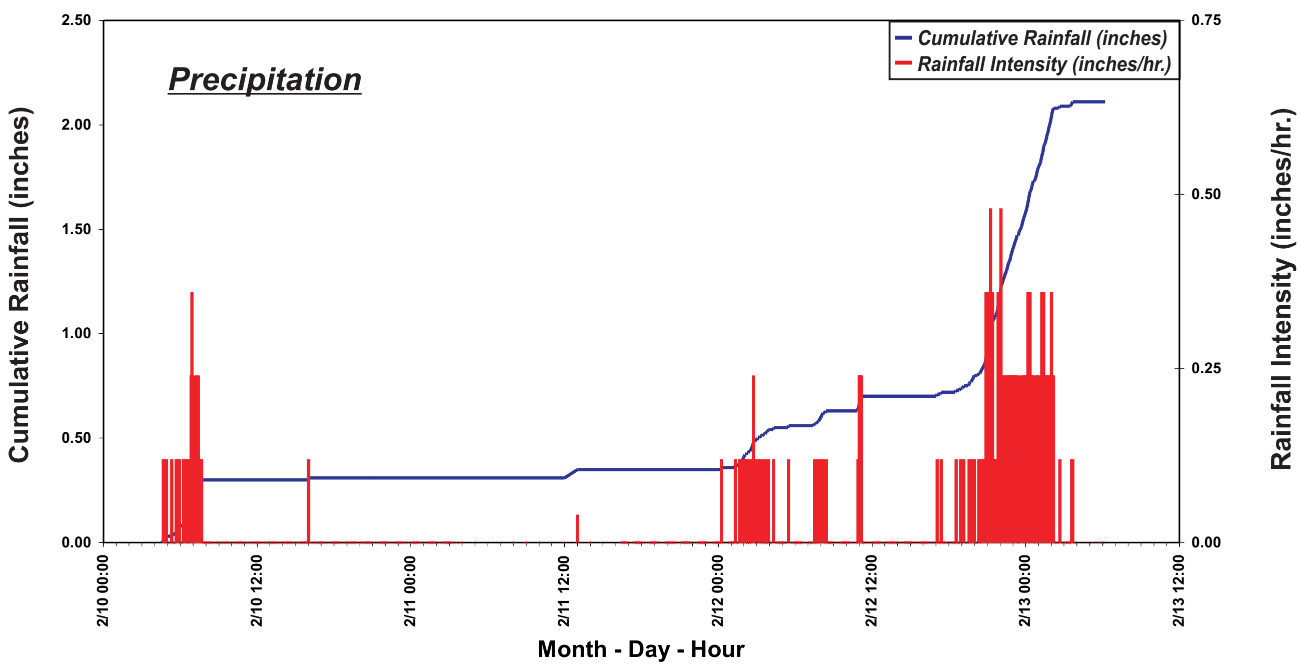
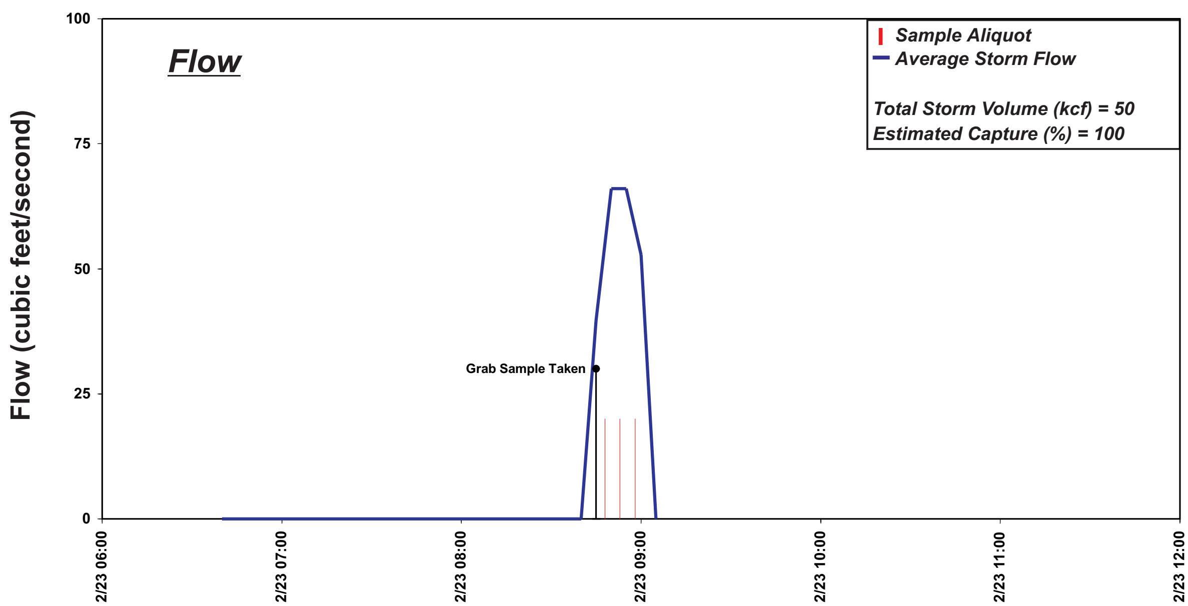


Figure 5.8 - Belmont Pump Station - Event 3 (23 February, 2001)



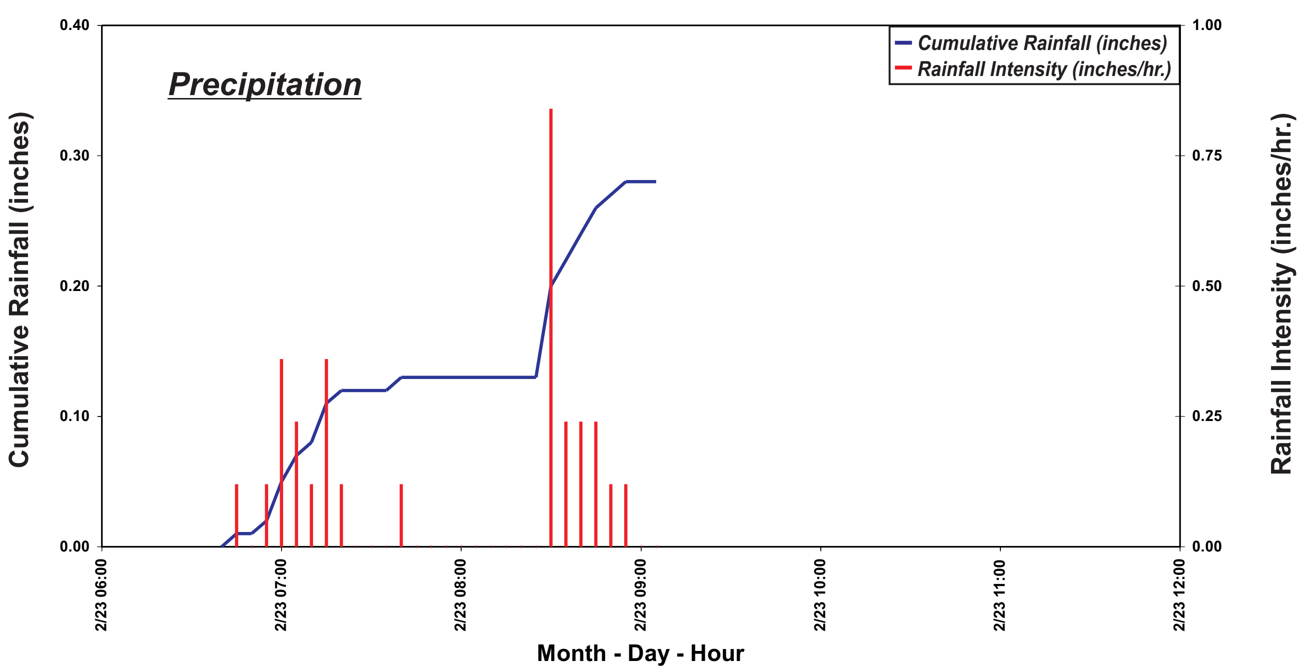


Figure 5.9 - Bouton Creek - Event 3 (23 February, 2001)

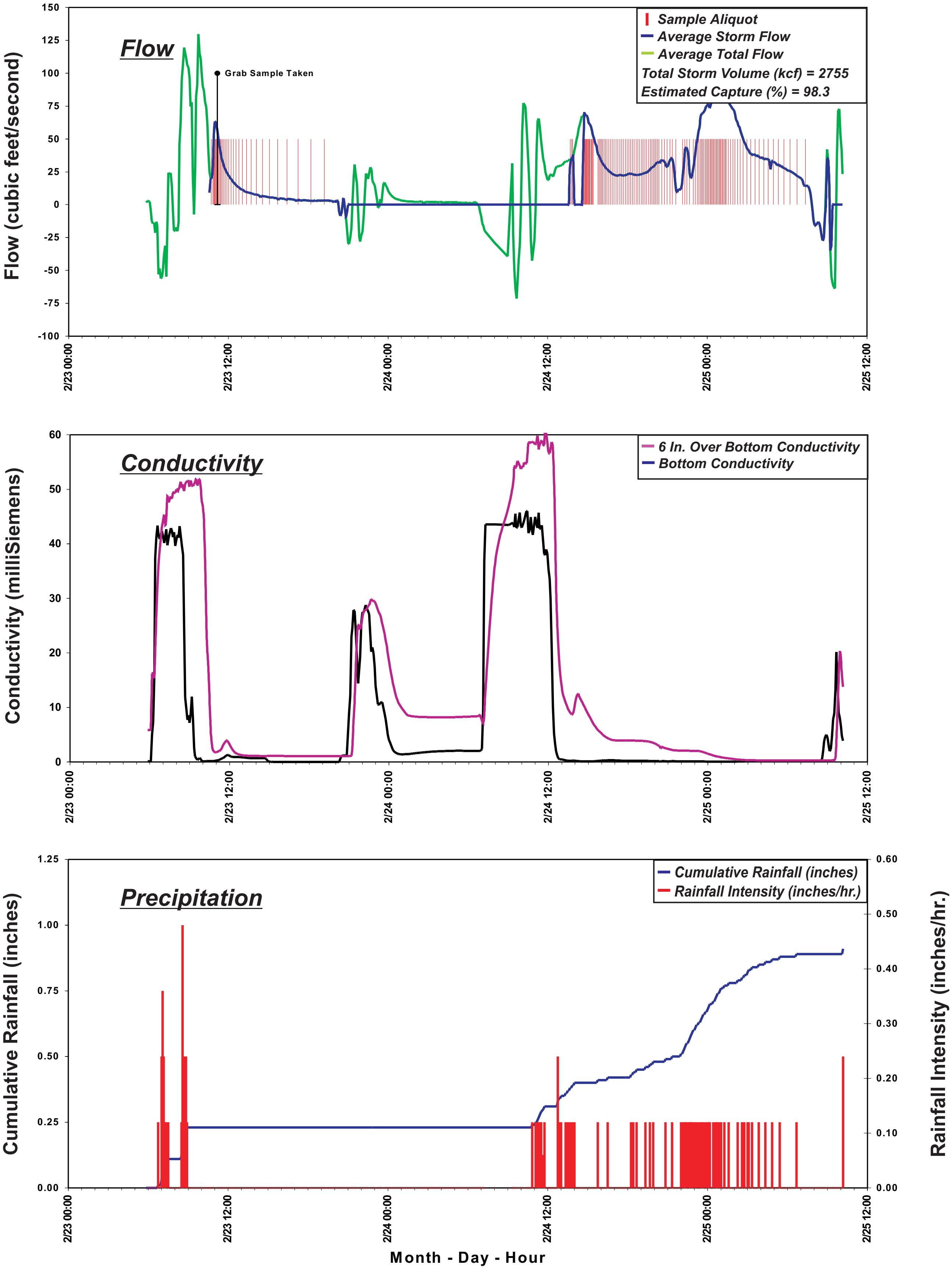
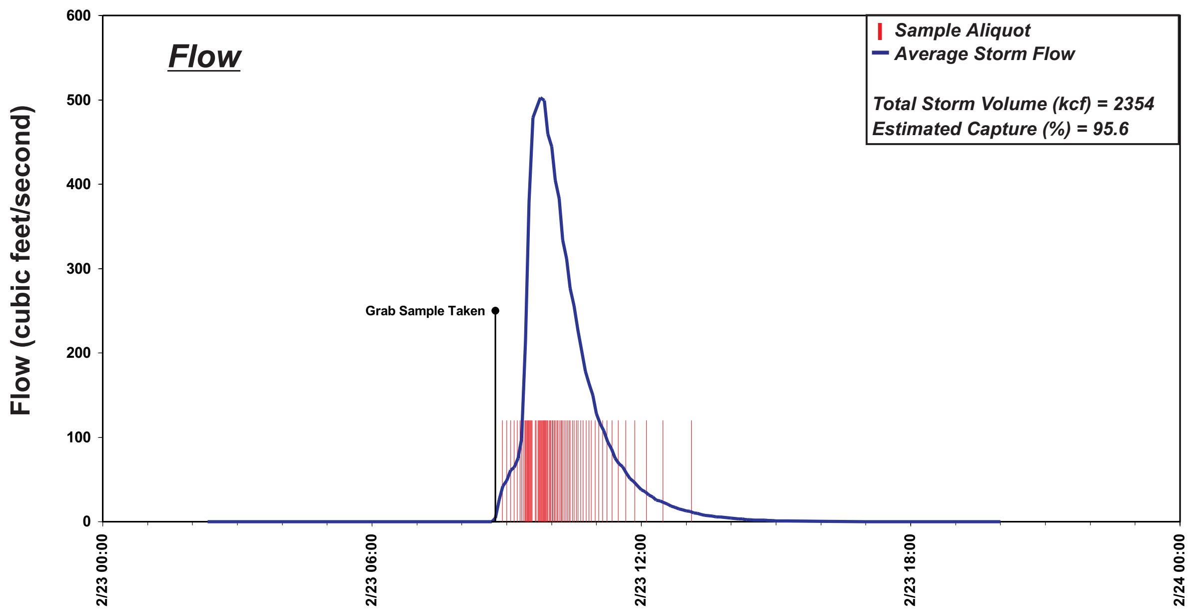


Figure 5.10 - Los Cerritos Channel - Event 3 (23 February, 2001)



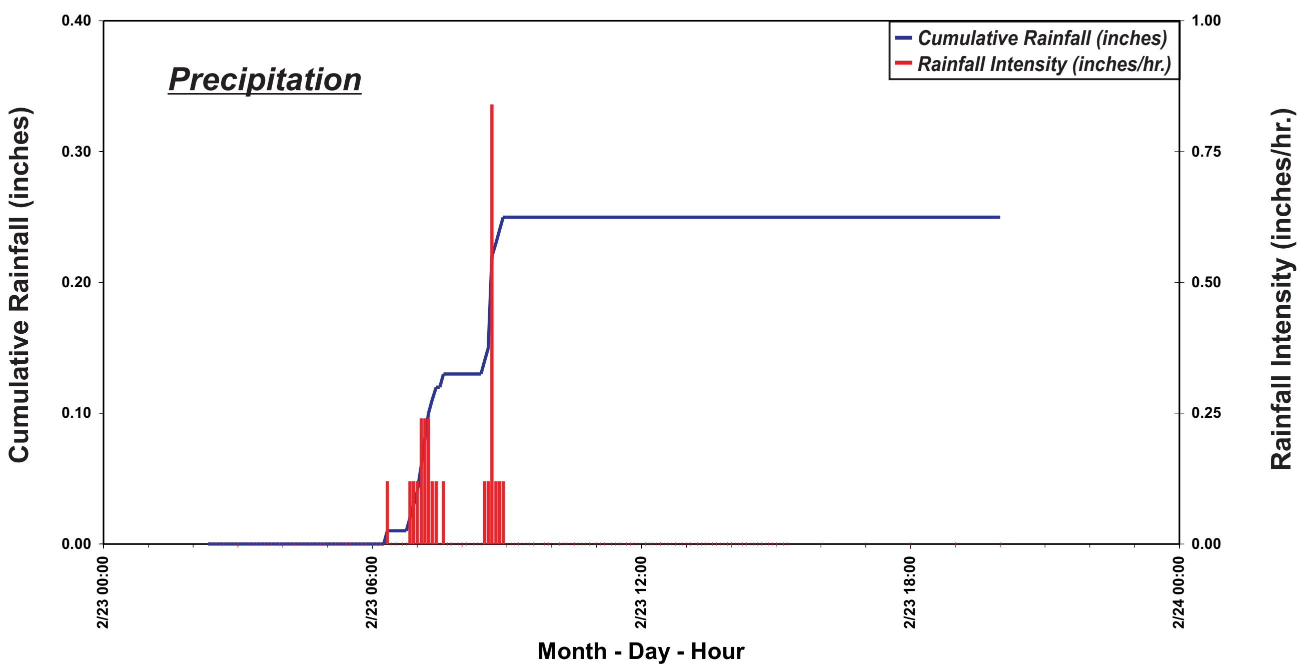
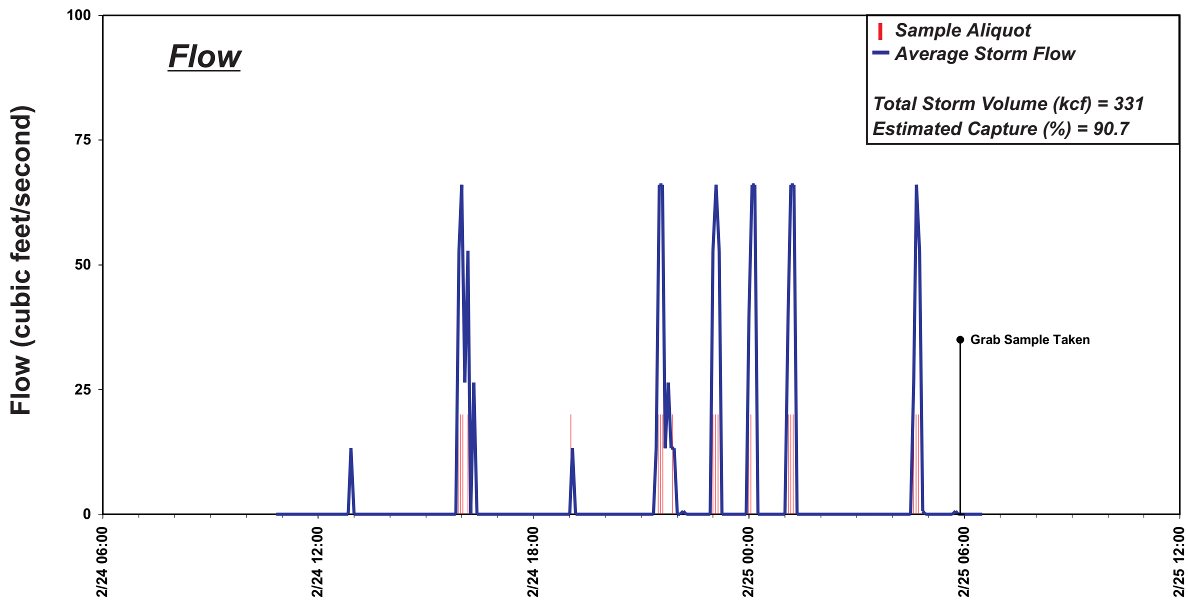


Figure 5.11 - Belmont Pump Station - Event 4 (24 February, 2001)



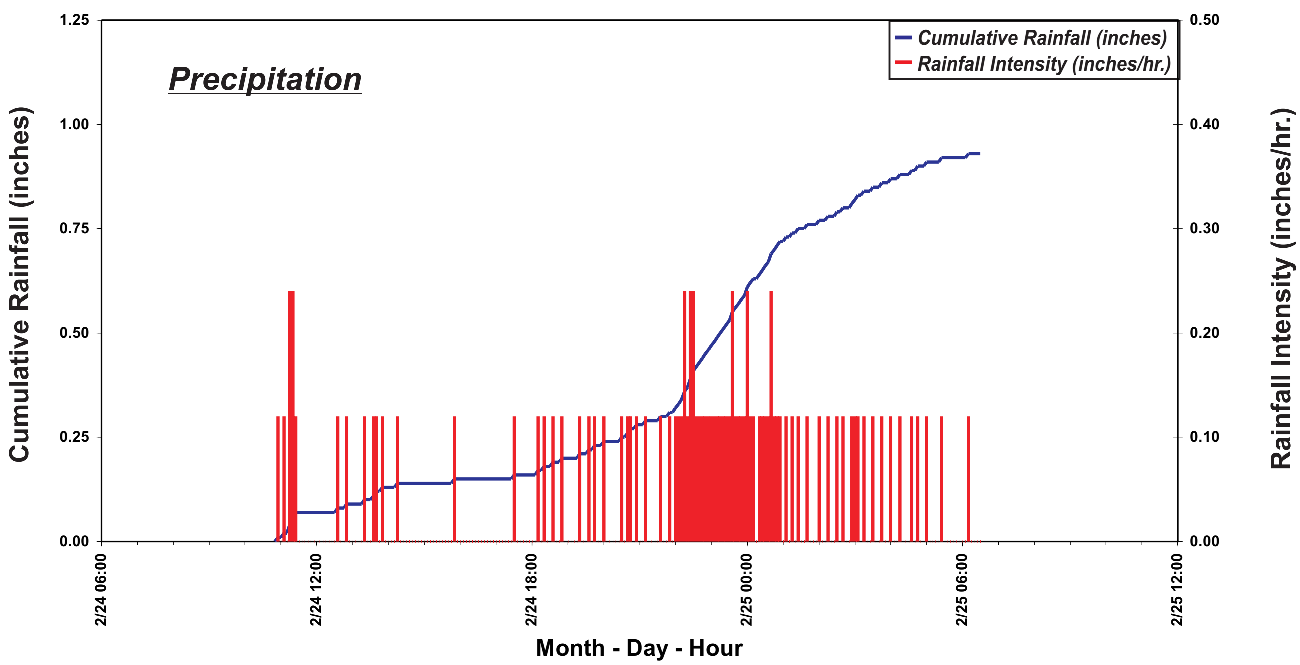
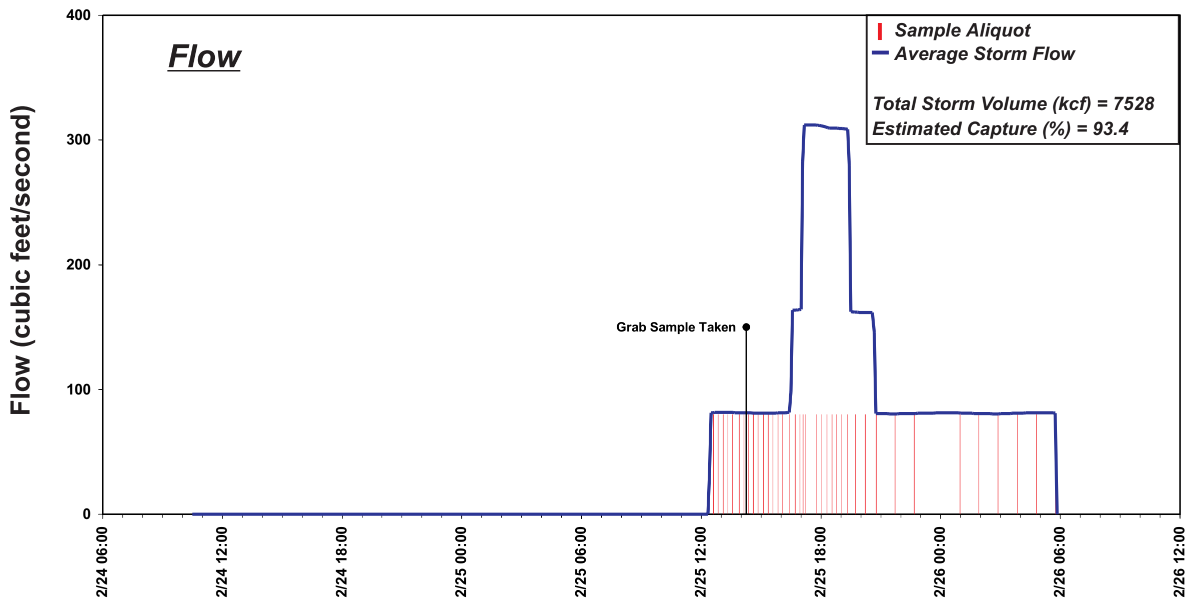


Figure 5.12 - Dominguez Gap Pump Station - Event 4 (24 February, 2001)



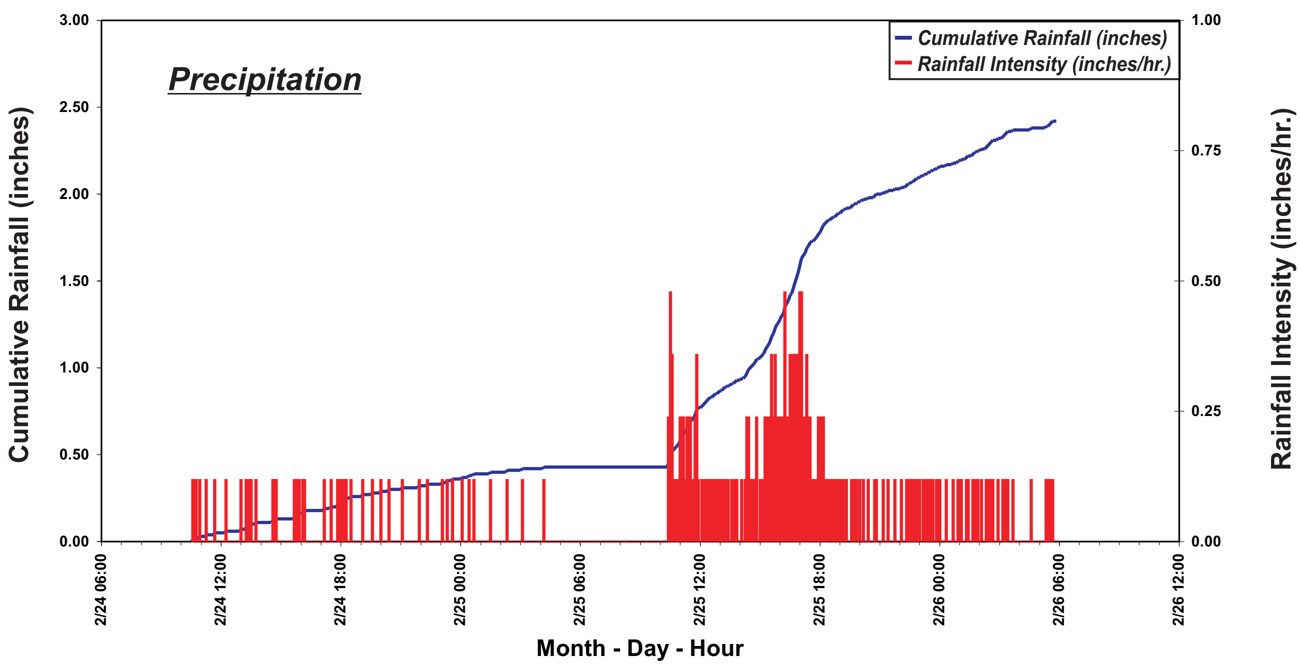
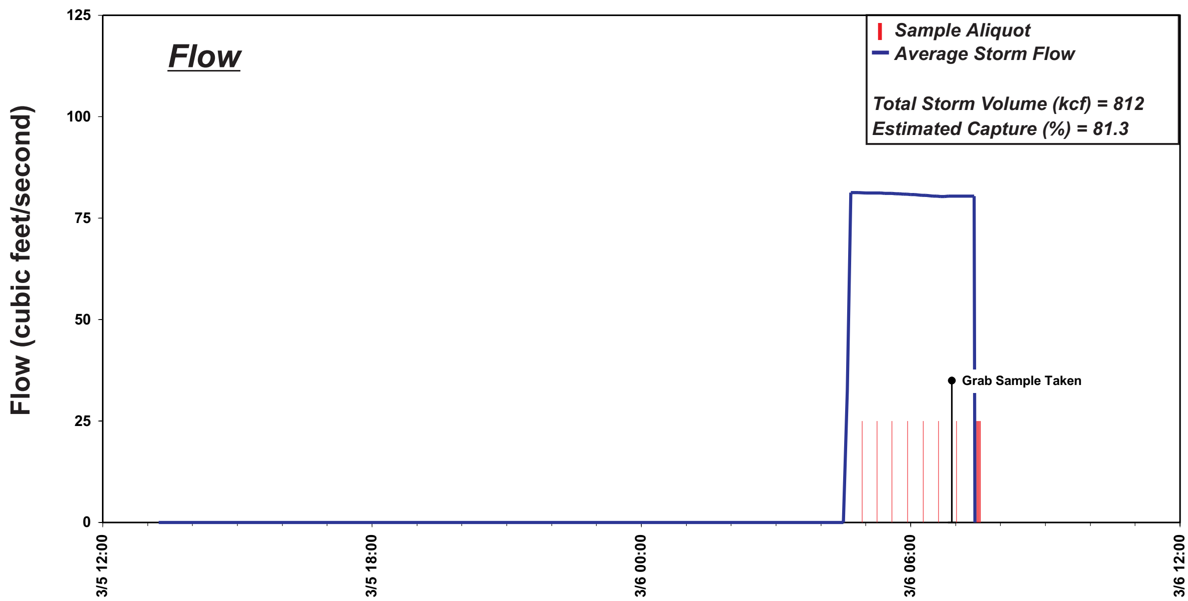


Figure 5.13 - Dominguez Gap Pump Station - Event 5 (5 March, 2001)



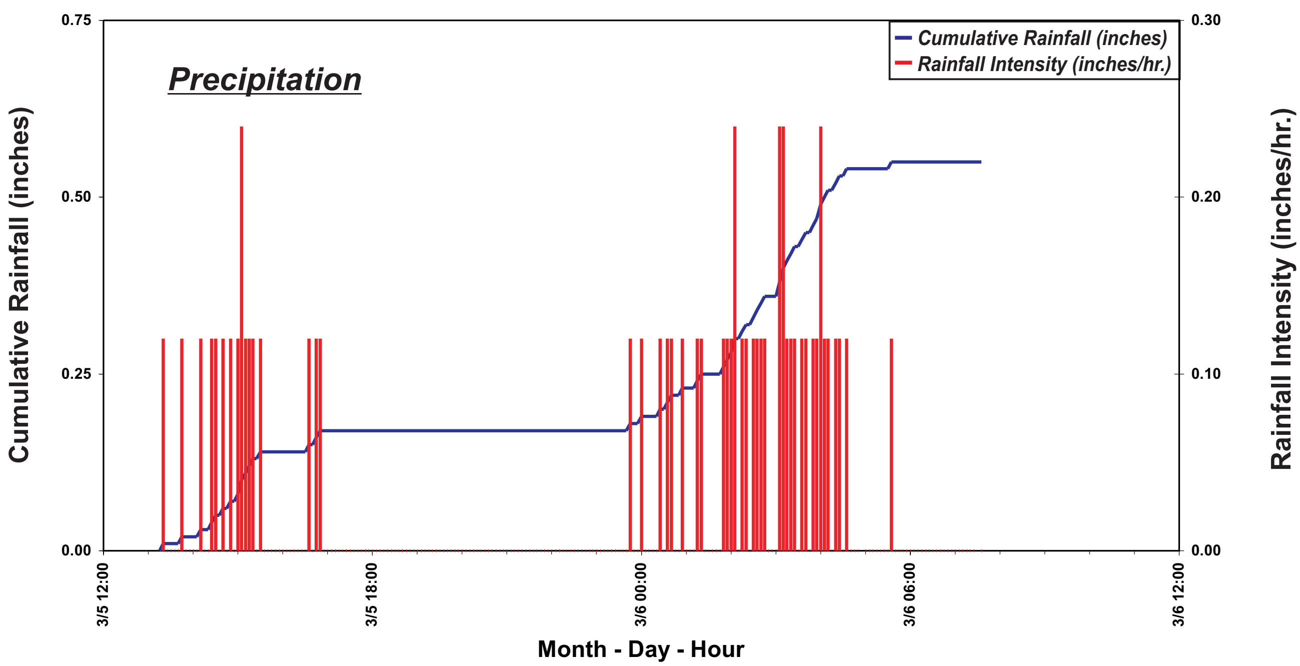
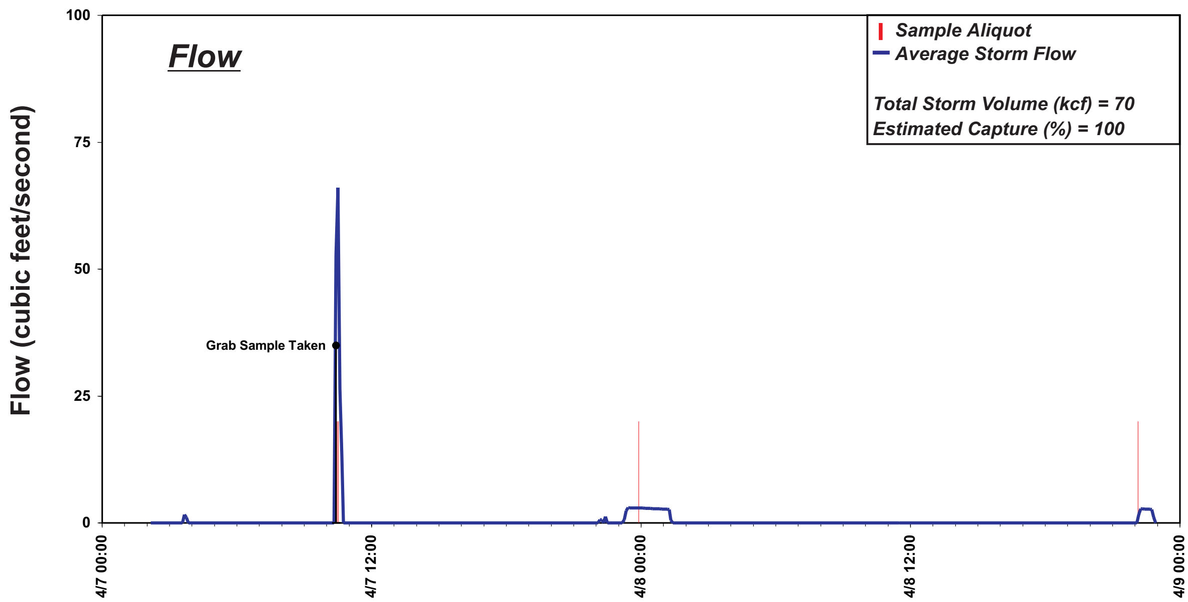


Figure 5.14 - Belmont Pump Station - Event 6 (7 April, 2001)



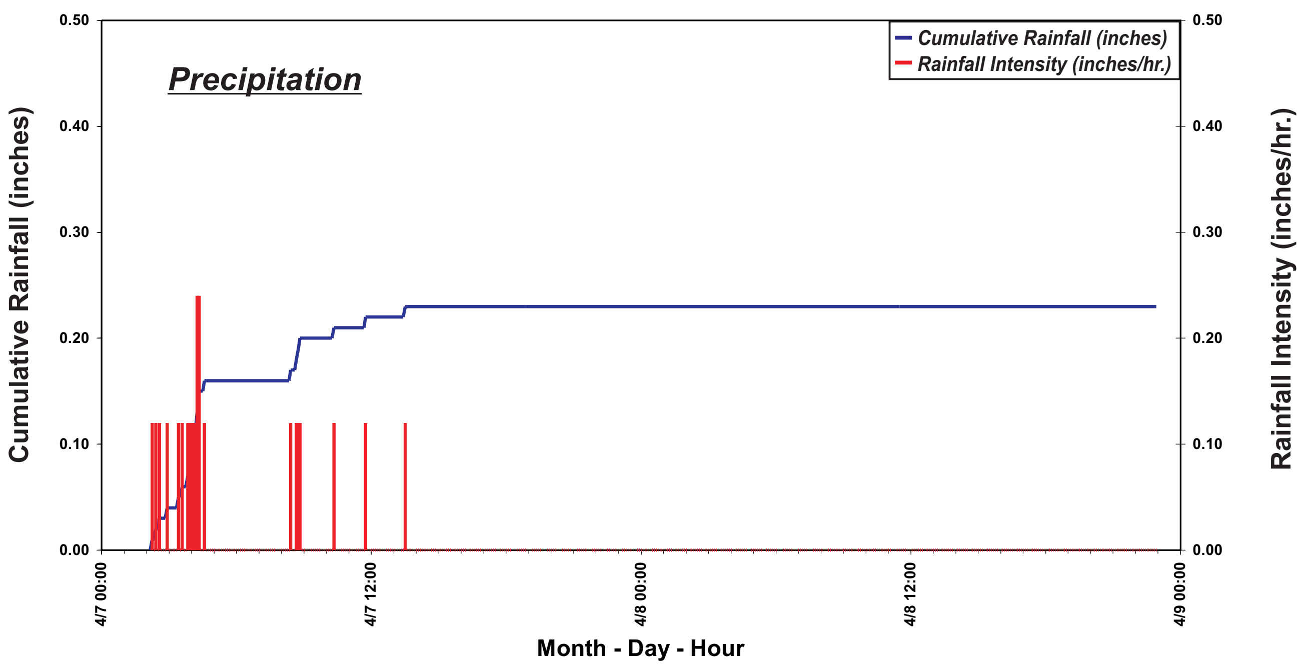
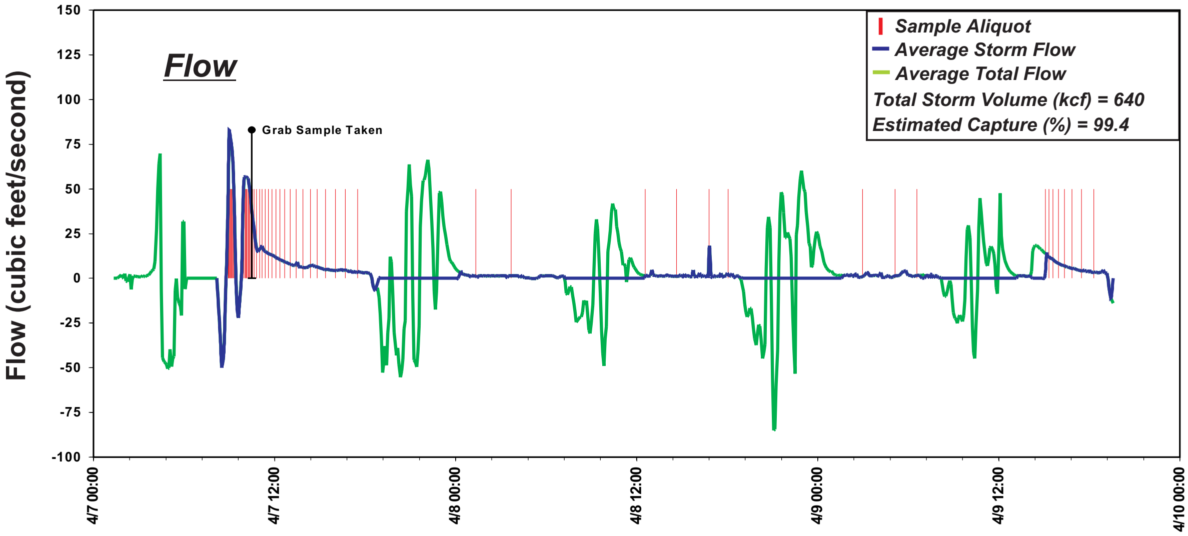
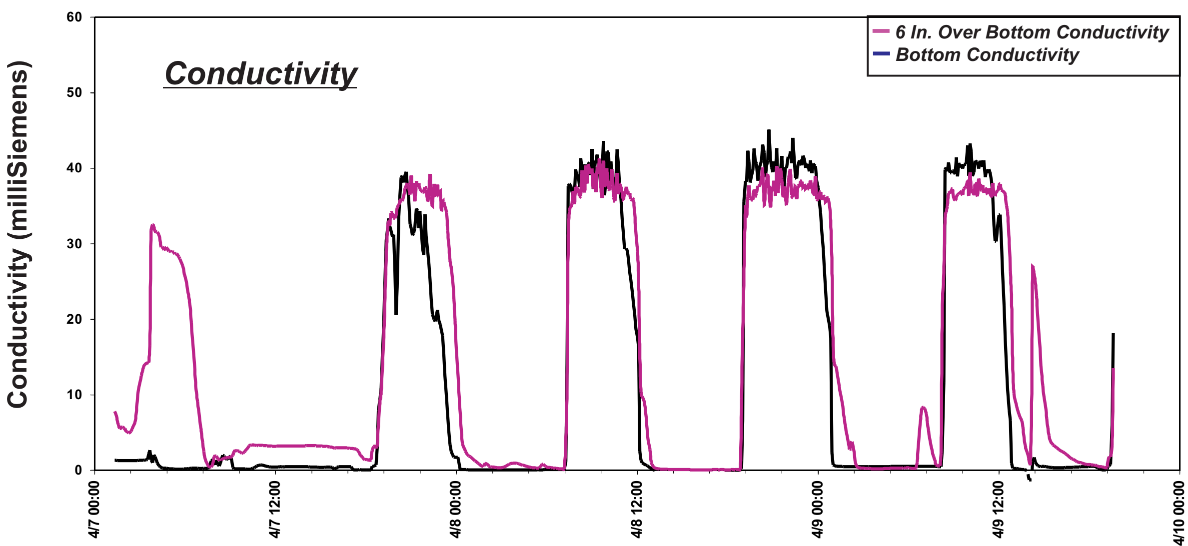


Figure 5.15 - Bouton Creek - Event 6 (7 April, 2001)





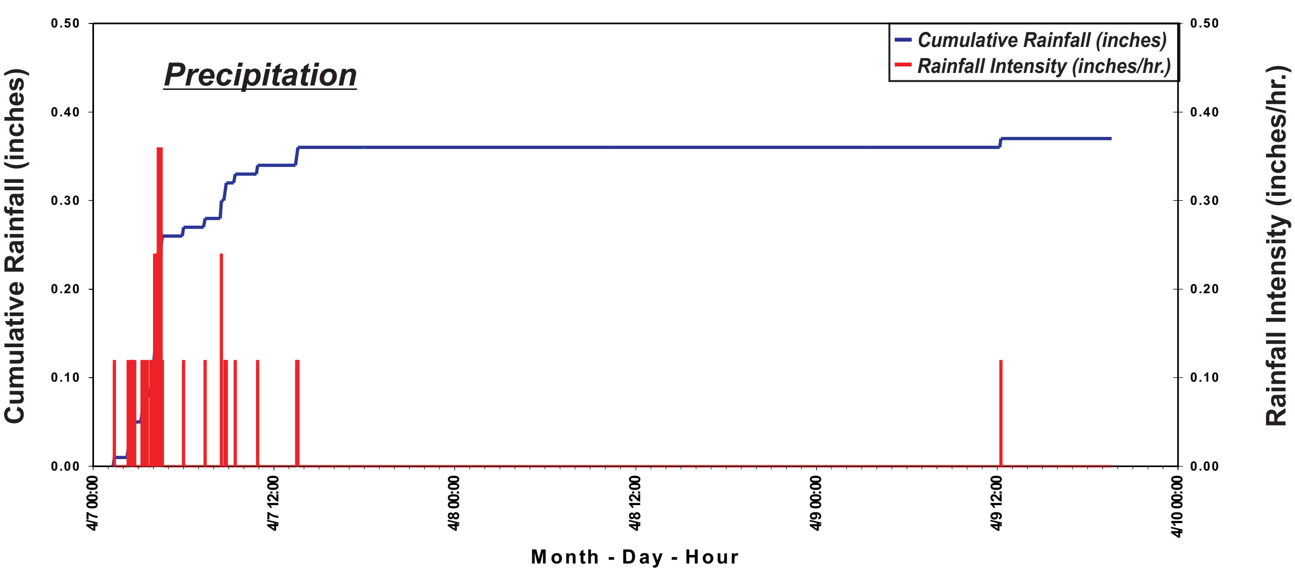
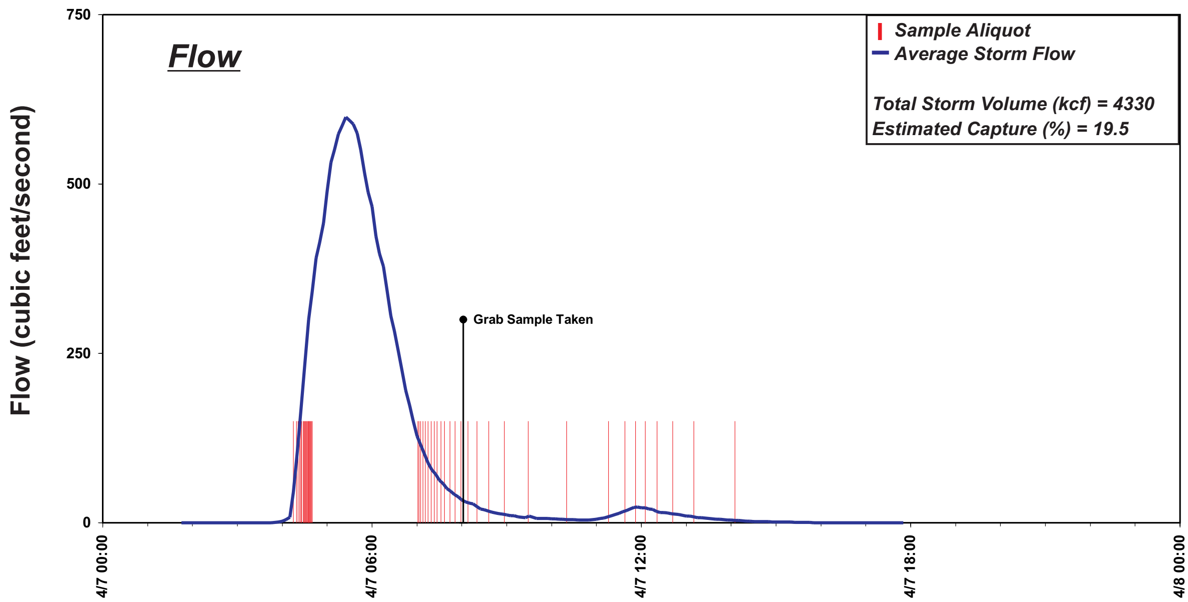


Figure 5.16 - Los Cerritos Channel - Event 6 (7 April, 2001)



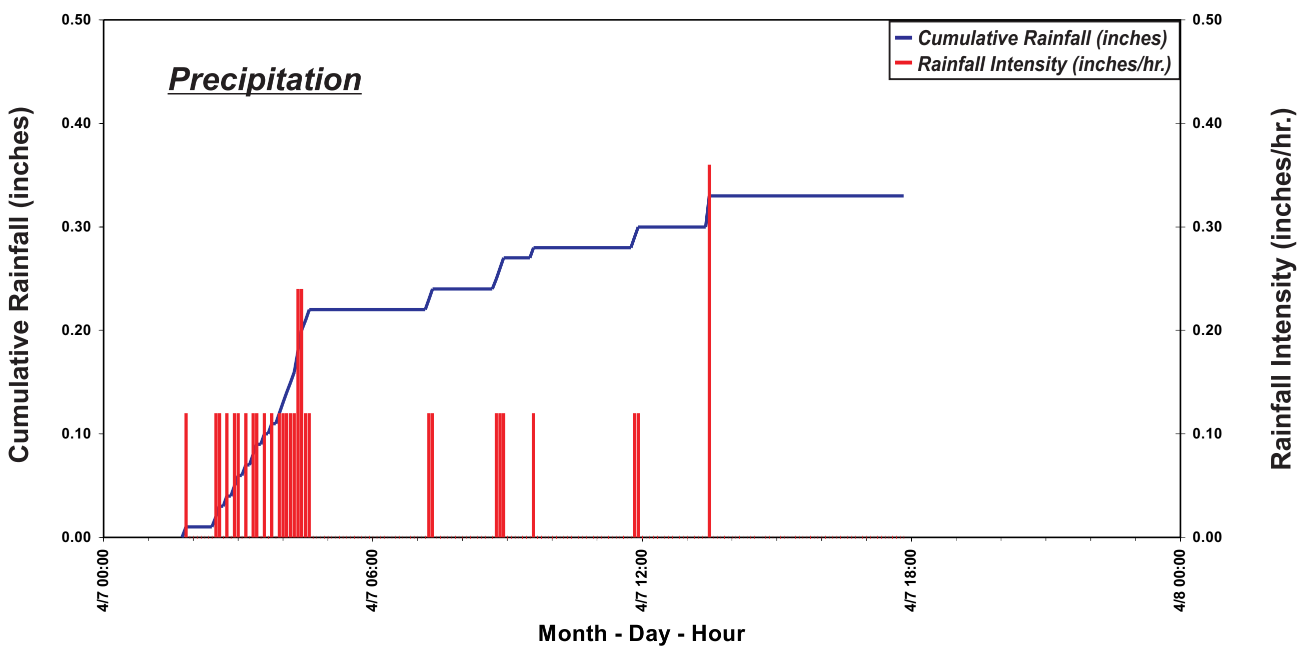
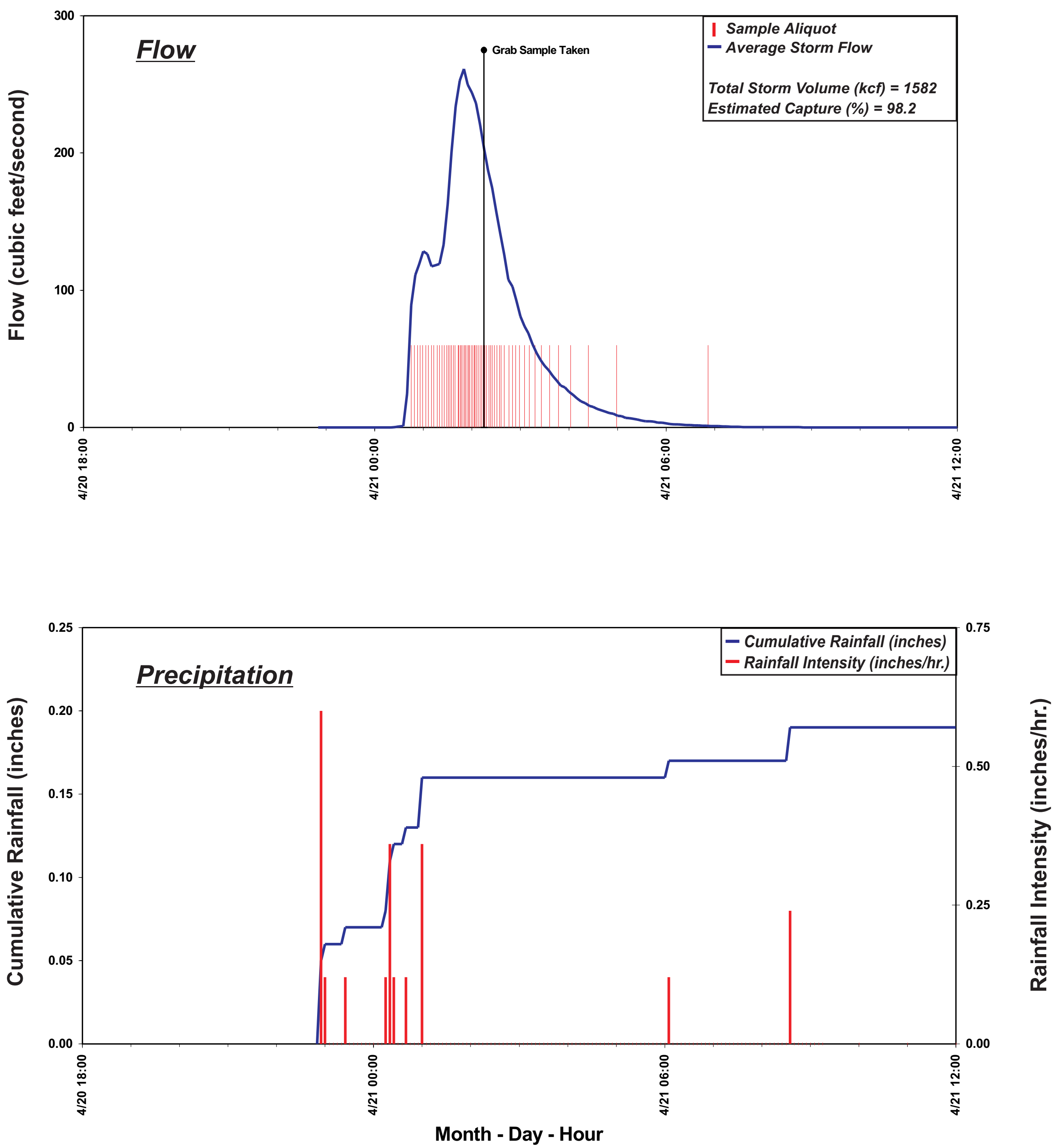


Figure 5.17 - Los Cerritos Channel - Event 7 (21 April, 2001)



monitored (10 through 12 February 2001) at the Dominguez Gap Pump Station had a total rainfall of 2.11 inches compared to 0.28 to 0.50 inches at the remaining three stations. More rainfall was sampled at the Dominguez Gap Pump Station compared to the other stations during Events 2 and 4. This occurred because two or more back-to-back events were actually combined. It took considerably more rainfall at this station before a discharge would occur. Rainfall during monitored events lasted an average of 1.6 days at the Dominguez Gap Pump Station compared to 0.4 days to 1.4 days at the remaining three stations. The sixth event on 7 April 2001 had the least amount of rainfall with rainfall totals ranging from 0.23 inches at the Belmont Pump Station to 0.37 inches at Bouton Creek. Dominguez Gap was not sampled during the sixth event because the 0.22 inches of rain that fell was not enough to cause a discharge. The same situation occurred during the third event (23 through 25 February 2001) even though 0.7 inches of rain fell over the two-day period. Because the sump at the Dominguez Gap Pump Station was near capacity, discharge did occur and was sampled on 5 through 6 March 2001 (Event 5) when only 0.55 inches of rain fell.

Rainfall intensities (inches per hour over a 5 minute period) were fairly moderate during most monitored events. The mean maximum intensities for monitored events ranged from around 0.45 inches of rain per hour at the Dominguez Gap Pump Station to 0.63 inches per hour at Bouton Creek. The most intense rain (1.2 inches per hour) fell on Bouton Creek during the first event and at the Belmont Pump Station during the second event. The least intense rain (maximum of 0.24 inches per hour) fell at the Belmont Pump Station during Events 4 and 6 and at the Dominguez Gap Pump Station during Event 5.

5.2 Storm Water Runoff During Monitored Events

Monitoring was designed to isolate rainfall events and the runoff created by those events. Table 5.2 provides descriptive statistics of flow characteristics among monitored events at each station, and Table 5.3 provides a summary of the runoff measured at each station in conjunction with each storm event. Figures 5.2 through 5.17 graphically depict flow during each monitored event at each station in response to rainfall. These figures also show how the aliquoting of each composite sample was conducted. Note that in a couple of cases, equipment malfunctions, human error, and/or less than ideal flow conditions compromised the quality of the runoff data. However, in all but one or two cases (Event 6 at Los Cerritos Channel and possibly Event 2 at the Belmont Pump Station) the flow proportioning of each sample aliquot was more than adequate. At the pump stations, additional water was collected from within the sumps immediately after discharge occurred in order to supplement the total sample volume. While the pumps were running, samples were collected in 1 liter aliquots at the pump stations compared to 250 ml aliquots at the creek stations.

In general, the drainage areas at each monitoring site are fairly large. This resulted in delayed response times of flow in relation to the advent of rain and fluctuations in rainfall intensity. Tidal effects at Bouton Creek also played a role in delaying runoff flow during most monitored events. Flow response at the pump stations was directly related to the capacity of the sumps. At Los Cerritos Channel, flow responded quicker to rainfall because a large portion of the drainage area is immediately upstream of the monitoring location. However, flow usually lasted several hours after rainfall subsided.

Sample composites at the four Long Beach monitoring stations during the 2000-2001 wet-weather season were derived from total storm volumes ranging from 50,000 to 331,000 cubic feet at the Belmont Pump Station (mean of 134,000 cubic feet); 640,000 to 2,755,000 cubic feet at Bouton Creek (mean of 1,458,000 cubic feet); 1,582,000 to 4,451,000 cubic feet at Los Cerritos

Table 5.3. Flow Data for Monitored Events During the 2000-2001 Wet-Weather Season

Site/Event	Start Flow Date	Start Flow Time	End Flow Date	End Flow Time	Duration of Flow (hours:minutes)	Total Storm Volume (kilo-cubic feet)	Volume To Sample (kcf)	No. of Sample Aliquots Collected	Peak Flow (cfs)	Percent Storm Capture	Peak Capture
Event 1											
BOUTON CREEK	1/25/2001	2315	1/27/2001	750	32:35	1582	11	109	118	87.9	Y
LOS CERRITOS CHANNEL	NA	NA	1/27/2001	435	NA	4451	30	41	247	96.2	Y
Event 2											
BELMONT PUMP ST.	2/10/2001	800	2/10/2001	1305	5:05	88	0.5	54	66	61	Y
BOUTON CREEK	2/10/2001	410	2/11/2001	900	28:50	858	11	75	92	100	Y
LOS CERRITOS CHANNEL	2/10/2001	620	2/10/2001	1940	13:20	2251	51	50	500	100	Y
DOMINGUEZ GAP PUMP ST.	2/12/2001	2232	2/13/2001	612	7:40	3370	7/21	154	644	100	Y
Event 3											
BELMONT PUMP ST.	2/23/2001	845	2/23/2001	905	0:20	50	20	13	66	100	Y
BOUTON CREEK	2/23/2001	1035	2/25/2001	925	46:50	2755	12	147	82	98.3	Y
LOS CERRITOS CHANNEL	2/23/2001	220	2/23/2001	2000	17:40	2354	19	73	503	95.6	Y
Event 4											
BELMONT PUMP ST.	2/24/2001	1255	2/25/2001	550	16:55	331	15	20	66	90.7	Y
DOMINGUEZ GAP PUMP ST.	2/25/2001	1223	2/27/2001	546	41:23	7528	70	38	311	93.4	Y
Event 5											
DOMINGUEZ GAP PUMP ST.	3/6/2001	433	3/6/2001	725	2:52	812	100	15	81.3	98.5	Y
Event 6											
BELMONT PUMP ST.	4/7/2001	340	4/8/2001	2255	43:15	70	14	13	66	100	Y
BOUTON CREEK	4/7/2001	220	4/9/2001	1935	65:15	640	11	58	82	99.4	Y
LOS CERRITOS CHANNEL	4/7/2001	330	4/7/2001	1725	13:55	4330	18	47	599	19.5	N
Event 7											
LOS CERRITOS CHANNEL	4/20/2001	2300	4/21/2001	920	10:20	1582	26	62	266	98.2	Y

NA = Not Available

Channel (mean of 2,993,000 cubic feet); and 812,000 to 7,528,000 cubic feet at the Dominguez Gap Pump Station (mean of 3,903,000). Peak flows during monitored events at the two creek stations ranged from 82 to 118 cfs at Bouton Creek and 247 to 599 cfs at Los Cerritos Channel. Due to the fact that only one discharge pump came on during monitored events, peak flow at the Belmont Pump Station was a consistent 66 cfs. Peak flow at the Dominguez Gap Pump Station ranged from 81 to 644 cfs.

The percent storm captures (percentage of the total storm event volume effectively represented by the flow-weighted composite sample) were typically in excess of 90%. This applies to all events at all sites where samples were submitted to the laboratory. A single poor event capture occurred at Los Cerritos Channel during Event 6 due to miss-communication with field crews. A marginal percent storm capture (61%) occurred at the Belmont Pump Station during Event 2 because the sump levels that trigger the discharge pumps to activate were not in sync with the monitoring equipment.

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6.0 CHEMISTRY RESULTS

6.1 Wet Weather Chemistry Results

Authorization and encroachment permits were received the fourth week of December 2000 to begin installing the automatic storm water monitoring stations for the City of Long Beach. Actual storm monitoring began the third week of January. During the remaining 2000-2001 wet weather season, four storm events were monitored at each of the designated Long Beach monitoring sites, with the exception of the Dominguez Gap Pump station that only discharged during three events during this period. In addition, one additional storm event was monitored at the Los Cerritos Channel site, because the fourth event at this site resulted in poor storm capture for the composite sample. The events that were monitored at each site, successfully sampled, and sent to the laboratories for analysis were the following (Table 6.1):

Table 6.1. Monitored Storm Events, 2000-2001

Station	Event 1 26-27 Jan '01	Event 2 10 –13 Feb '01	Event 3 23 Feb '01	Event 4 25-26 Feb '01	Event 5 6 Mar '01	Event 6 7 Apr '01	Event 7 21 Apr '01
Bouton Creek	X	X		X		X	
Belmont Pump		X	X	X		X	
Los Cerritos Channel	X	X	X			X	X
Dominguez Gap		X		X	X		

For each of these monitored events, all chemical constituents summarized in Table 4.2 above were analyzed in the resulting samples for all stations. The only exception was Event 2 (February 10, 2001) at the Belmont Pump Station where the grab samples were not collected because the crew could not get into the pump station at the time. The automatic sampler located outside the pump station with tubing inserted into the station still functioned. Subsequent to this event, the grabs samples were taken at the discharge point into Alamitos Bay to avoid this problem. Receiving waters were also sampled during four wet weather events, these being Events 1, 2, 3, and 6, and the samples were analyzed for toxicity and bacteria.

Composite samples collected during these storm events were also tested for toxicity with three species, the water flea (freshwater crustacean), mysid (marine crustacean), and sea urchin (marine).

The results of the chemical analysis of these composite and grab storm water samples are summarized in Table 6.2. Bacterial results for the Alamitos Bay receiving water site are summarized in Table 6.3. Toxicity results for the composite samples and the receiving water samples from these monitored events are given in Section 7 below.

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Table 6.2 Storm Water Chemistry Results: City of Long Beach Storm Water Monitoring Project. (Page 1 of 5)

ANALYTE	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL					DOMINGUEZ GAP			EPA Method Number	Target Reporting Limit	Achieved Reporting Limit
	10 Feb '01	23 Feb '01	25 Feb '01	7 Apr '01	26 Jan '01	11 Feb '01	25 Feb '01	7 Apr '01	27 Jan '01	10 Feb '01	23 Feb '01	7 Apr '01	21 Apr '01	13 Feb '01	26 Feb '01	6 Mar '01			
CONVENTIONALS																			
Oil and Grease (mg/L)	NS	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	8.0	5.0U	5.0U	5.0U	1664	5.0	5.0
Total Phenols (mg/L)	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	420.1	0.1	0.1
Cyanide (µg/L)	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	335.2	10.0	5.0
pH (units)	7.7	7.3	6.8	6.8	7.1	7.4	6.1	6.6	7.3	6.9	7.2	7.0	7.2	7.0	7.3	6.5	150.1	0.1	0.1
Dissolved Phosphorus (mg/L)	0.23	0.16	0.2	0.22	0.12	0.08	0.097	0.042	0.14	0.13	0.098	0.11	0.22	0.33	0.27	0.17	365.3	0.03	0.001
Total Phosphorus (mg/L)	0.45	0.47	0.32	0.51	0.44	0.37	0.19	0.25	0.62	0.76	0.54	0.98	0.61	0.49	0.46	0.29	300	0.03	0.002
Turbidity (NTU)	30	91	24	38	110	71	35	43	130	230	150	210	83	70	73	63	180.1	0.05	0.1
Total Suspended Solids (mg/L)	62	120	24	60	350	76	24	28	260	260	210	350	170	50	40	42	160.20	1.0	1.0
Total Dissolved Solids (mg/L)	310	100U	110U	270	68U	310	120	350	62U	98U	58U	150	120	38U	64U	42U	160.1	1.0	1.0
Volatile Suspended Solids (mg/L)	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	160.4	2.0	1.0
Total Organic Carbon (mg/L)	8.6U	6.2U	4.6U	32U	13U	18U	5.5U	29U	12U	18U	8.4U	22U	30U	4.2U	5.7U	6.4U	415.1	1.0	1.0
Total Recoverable Petroleum Hydrocarbon (mg/L)	NS	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	1664	5.0	5.0
Biochemical Oxygen Demand (mg/L)	10U	17	10U	22	14	10	22	10	14	12	15	11	28	10U	10U	23	405.1	5.0	10.0
Chemical Oxygen Demand (mg/L)	62	97	40U	140U	92	120	42U	120U	89	200	100	160U	170	42U	84	29U	410.1	10.0	4.0
Total Ammonia-Nitrogen (mg/L)	0.92	0.37	0.31	0.9	0.53	1.4	0.34	0.5	0.54	1.2	0.48	0.73	0.87	0.32	0.18	0.19	350.3	0.1	0.1
Total Kjeldahl Nitrogen (mg/L)	1.3	1.9	1.1	4.1	2.6	1.7	0.9	2.5	2.5	2.9	1.7	4.5	4.5	0.78	0.93	0.99	351.4	0.1	0.1
Nitrite Nitrogen (mg/L)	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	300	0.1	0.2
Nitrate Nitrogen (mg/L)	0.48	0.33	0.33	2	0.55	0.75	0.27	0.97	0.61	0.77	0.31	1.3	0.96	0.28	0.17	0.24	300	0.1	0.01
Alkalinity, as CaCO3 (mg/L)	76	27	36	46	18	32	21	23	20	21	17	33	24	20	23	18	310.1	2.0	0.1-1.0
Specific Conductance (µmhos/cm)	540	160	200	380	110	510	210	550	69	99	64	160	130	74	69	57	120	1.0	1.0
Total Hardness (mg/L)	84	210	120	110	23	80	190	99	22	49	41	67	150	43	150	30	SM-2340 B	2.0	1.0
MBAS (mg/L)	0.068	0.078	0.088	0.26	0.39	0.153	0.093	0.24	0.053	0.036	0.082	0.24	0.11	0.02U	0.049	0.07	425	0.5	0.02
Chloride (mg/L)	130	28	30	60	27	150	39	120	5.3	7.6	4.2	13	12	4.6	4.13	4.2	300	2.0	1.0
Fluoride (mg/L)	0.23	0.13	0.13	0.25	0.1U	0.26	0.15	0.21	0.1U	0.2	0.1U	0.2	0.2	0.02U	0.08	0.1U	300	0.1	0.1
Sulfate (mg/L)	39	13	15	31	7.7	33	11	29	6.3	8.7	6.3	13	14	5.7	5.41	4.6	300.0	2.0	2.0
Methyl tertiary butyl ether (MTBE) (µg/L)	NS	1.0U	1.0U	1.0U	1.4	1.0U	1.2	1.0U	1.0U	1.9	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8020A	1.0	1.0
BACTERIA (mpn/100mL)																			
Total Coliform	NS	22,000	130,000	160,000	80,000	50,000	28,000	13,000	110,000	50,000	170,000	90,000	300,000	110,000	30,000	50,000	SM-9221 B	20	2.0
Fecal Coliform	NS	1,700	90,000	50,000	13,000	8,000	13,000	3,000	5,000	8,000	30,000	28,000	50,000	8,000	8,000	23,000	SM-9221 B	20	2.0
Fecal Streptococcus	NS	10,000	13,400	19,500	2,360	12,400	7,800	9,000	1,640	11,400	8,200	12,000	9,180	8,100	17,200	19,200	SM-9221 B	20	1.0
TOTAL METALS (µg/L)																			
Aluminum	490	860	300	980	1500	800	390	390	3500	2400	1700	1700	600	1300	530	1900	200.8	25.0	50
Arsenic	2.1U	1.8U	1.3U	1.9	3.2	2.2	0.98U	1.4	4.6	3.5	0.5U	4.6	3	2.4	2.1U	1.6	206.2	0.5	0.5
Beryllium	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.9	200.8	1.0	1.0
Cadmium	0.5U	0.83	0.5U	0.95	0.7	0.5U	0.5U	0.72	1.7	0.81	1.3	3.3	1.8	0.5U	0.5U	0.5U	200.8	0.2	0.5
Chromium	2.1	3.7	1.9	5.4	3.9	2.7	1.5	4.3	7	5.7	4.9	10	3.7	1.9	1.5	2.3	200.8	1.0	1.0
Copper	19	62	28	78	28	24	11U	20	29	30	30	44	30	8.9	11U	19	7196	1.0	1.0
Hexavalent Chromium (mg/L)	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	0.02U	200.8	0.01	0.02
Iron	860	1400	350	930	1200	1200	610	700	9700	1800	1500	1800	2500	850	1200	2100	236.1	25	25
Lead	27	54	15	19	53	17	10	9.4	59	34	52	44	35	11	11	11	200.8	1	1.0
Mercury	0.2U	0.2U	0.2U	0.2U	0.27	0.2U	0.2U	0.44	0.21	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	245.1	0.2	0.2
Nickel	3.2	7.3	3.1	18	5.3	6.0	2.5	5.2	9.2	7.6	8.4	15	12	2.1	3.0	2.9	200.8	2.0	1.0
Zinc	150	280	110	410	210	130	72	220	250	290	290	960	420	65	51	78	200.8	5.0	5.0
DISSOLVED METALS (µg/L)																			
Aluminum	50U	200	70	50U	170	50U	67	50U	350	150	79	50U	81	220	120	230	200.8	25.0	50.0
Arsenic	1.4	0.8	0.95	1.1	1.3	0.9	0.9	1.1	1.5	1.3	0.5U	1	1.3	1.8	1.7	0.9	206.2	0.5	0.5
Beryllium	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	200.8	1.0	1.0
Cadmium	0.5U	0.5U	0.5U	0.3	0.5U	0.5U	0.5U	0.4	0.5U	0.5U	0.5U	0.21	0.55	0.5U	0.5U	0.5U	200.8	0.2	0.5
Chromium	1.0U	1.1	1.1	1.9	1.0U	1.0U	1.0U	1.9	1.0U	1.2	1.3	1.6	1.7	1.0U	1.0U	1.0U	200.8	1.0	1.0
Copper	4.8	22	12	19	5.3	9.2	11	12	11	11	12	3.6	12	3.9	6.8	8.2	7196	1.0	1.0
Iron	25U	200	60U	100	420	70	60U	120	290	100	25U	110	760	140	100U	130	236.1	25.0	25.0
Lead	1.0U	2.1	1.3	1.5	3	1.2	1.4	2	1.1	1.0U	1.1	1.0U	1.4	1.0U	1.3	1.0U	200.8	1.0	1.0
Mercury	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	245.1	0.2	0.2

Table 6.2 Storm Water Chemistry Results: City of Long Beach Storm Water Monitoring Project. (Page 2 of 5)

	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL					DOMINGUEZ GAP			EPA Method Number	Target Reporting Limit	Achieved Reporting Limit
ANALYTE	10 Feb '01	23 Feb '01	25 Feb '01	7 Apr '01	26 Jan '01	11 Feb '01	25 Feb '01	7 Apr '01	27 Jan '01	10 Feb '01	23 Feb '01	7 Apr '01	21 Apr '01	13 Feb '01	26 Feb '01	6 Mar '01			
DISSOLVED METALS (µg/L) (continued)																			
Nickel	1.4	2.5	2.9	6.2	1.6	1.5	2	3.5	1.7	3.5	2.3	2.9	6.8	1.0U	1.7	2.3	200.8	2.0	1.0
Zinc	36	110	54	220	36	39	50	140	42	75	51	66	150	23	21	29	200.8	5.0	5.0
CHLORINATED PESTICIDES (µg/L)																			
Aldrin	0.05U	0.05U	0.05U	0.05U	0.05UJ	0.05U	0.05U	0.05U	0.05UJ	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
Alpha-BHC	0.05U	0.05U	0.05U	0.052	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.12	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
Beta-BHC	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.1	0.05U	0.05U	0.082	8081	0.05	0.05
Delta-BHC	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
Gamma-BHC (lindane)	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
Alpha-Chlordane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	8081	0.5	0.5
Gamma-Chlordane	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	8081	0.5	0.5
4,4'-DDD	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
4,4'-DDE	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
4,4'-DDT	0.5U	0.1U	0.1U	0.1U	0.5UJ	0.05U	0.1U	0.01U	0.5UJ	0.05U	0.1U	0.05U	0.1U	0.05U	0.05U	0.1U	8081	0.05	0.05-0.1
Dieldrin	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	8081	0.1	0.1
Endosulfan I	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
Endosulfan II	0.1U	0.05U	0.05U	0.05U	0.1U	0.1U	0.05U	0.05U	0.1U	0.1U	0.05U	0.1U	0.05U	0.1U	0.1U	0.1U	8081	0.05	0.05-0.1
Endosulfan sulfate	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	8081	0.1	0.1
Endrin	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	8081	0.1	0.1
Endrin Aldehyde	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	8081	0.1	0.1
Endrin Ketone	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	0.1U	8081	0.1	0.1
Heptachlor	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
Heptachlor Epoxide	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	0.05U	8081	0.05	0.05
Methoxychlor	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	8081	0.5	0.5
Toxaphene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0
Total PCBs	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0
CARBAMATE & UREA PESTICIDES (µg/L)																			
Oxamyl	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	2.0	10
Methomyl	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	2.0	10
Fenuron	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	632	2.0	4
Monuron	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	632	2.0	4
Propoxur	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	2.0	10
Carbofuran	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	4.0	10
Carbaryl	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	2.0	10
Flumeturon	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	632	2.0	4
Diuron	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	6.8	4.0U	4.0U	4.0U	4.0U	4.0U	632	2.0	4
Propham	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	2.0	10
Siduron	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	2.0	10
Methiocarb	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	R	10U	10U	10U	632	4.0	10
Linuron	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	632	2.0	4
Swep	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	632	2.0	4
Chlorpropham	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	2.0	10
Brabane	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	632	2.0	10
Neburon	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	4.0U	632	2.0	4
AROCLORS (µg/L)																			
Aroclor-1016	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0
Aroclor-1221	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0
Aroclor-1232	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0
Aroclor-1242	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0
Aroclor-1248	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0
Aroclor-1254	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0
Aroclor-1260	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8081	1.0	1.0

Table 6.2 Storm Water Chemistry Results: City of Long Beach Storm Water Monitoring Project. (Page 3 of 5)

	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL					DOMINGUEZ GAP			EPA Method	Target Reporting	Achieved
ANALYTE	10 Feb '01	23 Feb '01	25 Feb '01	7 Apr '01	26 Jan '01	11 Feb '01	25 Feb '01	7 Apr '01	27 Jan '01	10 Feb '01	23 Feb '01	7 Apr '01	21 Apr '01	13 Feb '01	26 Feb '01	6 Mar '01	Number	Limit	Reporting Limit
ORGANOPHOSPHATE PESTICIDES (µg/L)																			
Azinphos methyl	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	1.0U	NP	NP	NP	8141A	0.05-1.0	1.0
Bolstar	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.05U	NP	NP	NP	8141A	0.05-1.1	0.05
Coumaphos	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	1.0U	NP	NP	NP	8141A	0.05-1.2	1.0
Demeton O & S	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.3	0.1
Diazinon	1.0U	1.0U	1.0U	1.0U	1.0UJ	1.0U	1.0U	1.0U	1.0UJ	1.0U	1.0U	1.0U	0.21	1.0U	1.0U	1.0U	8141A	0.05	0.01-1.0
Dicholorvoz	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.0	0.1
Disulfoton	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.0	0.1
Dursban (chlorpyrifos)	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	0.05U	1.0U	1.0U	1.0U	8141A	1.0	0.05-1.0
Ethoprop	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.05U	NP	NP	NP	8141A	0.05-1.0	0.05
Fensulfothion	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.0	0.1
Fenthion	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.0	0.1
Merphos	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.05U	NP	NP	NP	8141A	0.05-1.0	0.05
Malathion	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	0.27	1.0U	1.0U	1.0U	8141A	1.0	0.1-1.0
Mevinphos	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.0	0.1
Parathion methyl	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.05U	NP	NP	NP	8141A	0.05-1.0	0.05
Phorate	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.0	0.1
Ronnel	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.0	0.1
Stirophos	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.05U	NP	NP	NP	8141A	0.05-1.0	0.05
Tokuthion	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.05U	NP	NP	NP	8141A	0.05-1.0	0.05
Tricholronate	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	NP	0.1U	NP	NP	NP	8141A	0.05-1.0	0.1
Prometryn	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8141A	1.0	1.0
Atrazine	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8141A	1.0	1.0
Simazine	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.1	1.0U	1.2	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8141A	1.0	1.0
Cyanazine	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	8141A	1.0	1.0
HERBICIDES (µg/L)																			
Dalapon	2.0U	2.9U	2.2UJ	2.0U	NP	2.0U	2.2UJ	2.0U	NP	2.0U	31.U	2.0U	2.0U	2.0U	2.2UJ	2.0U	8151A	5.0	2.0-3.1
Dicamba	0.05U	0.29U	0.22U	0.5U	NP	0.5U	0.22U	0.5U	NP	0.5U	1.8	0.5U	0.5U	0.5U	0.22U	0.5U	8151A	0.5	0.22-0.50
MCPP	250U	59	22U	250U	NP	250U	80	250U	NP	250U	31U	250U	250U	250U	22U	250U	8151A	100	22-250
MCPA	250U	29U	48	250U	NP	250U	22U	250U	NP	250U	31U	250U	R	250U	22U	250U	8151A	100	22-250
Dichlorprop	1.0U	0.29U	0.22U	1.0U	NP	1.0U	0.95	1.0U	NP	1.0U	0.31U	1.0U	1.0U	1.0U	0.22U	1.0U	8151A	1.0	0.22-1
2,4-D	1.0U	0.29U	0.22U	2.0U	1.0U	1.0U	0.22U	1.0U	1.0U	1.0U	0.94	1.0U	1.0U	1.0U	0.22U	1.4	8151A	1.0	0.22-2.0
2,4,5-TP-Silvex	0.5U	0.29U	0.22U	0.5U	5.0U	0.5U	0.22U	0.5U	5.0U	0.5U	0.31U	0.5U	0.5U	0.5U	0.22U	0.5U	8151A	5.0	0.22-0.50
2,4,5-T	0.5U	0.29U	0.22U	1.0U	NP	0.5U	0.22U	1.0U	NP	0.5U	0.31U	1.0U	1.0U	0.5U	0.22U	0.5U	8151A	5.0	0.22-1.0
2,4-DB	1.0U	1.6	0.49	7.0U	NP	1.0U	1.0	4.0U	NP	1.0U	1.4	5.0U	20U	2.0U	0.43	1.0U	8151A	5.0	0.22-20.0
Dinoseb	0.5U	0.29U	0.22U	0.5U	NP	0.5U	0.22U	0.5U	NP	0.5U	0.31U	0.5U	10U	0.5U	0.22U	0.5U	8151A	5.0	0.22-10.0
Bentazon	R	1.0U	1.0U	2.0U	1.0U	R	1.0U	1.0U	1.0U	R	1.0U	1.0U	20U	R	1.0U	1.0U	515.1	1.0	1.0-20.0
Glyphosate	8.3	5.0U	5.0U	15	5.0U	5.0U	5.0U	9.8	5.0U	5.0U	9.0	94.0	16	5.0U	5.0U	5.0U	547	5.0	5-10.0
SEMIVOLATILES (µg/L)																			
Acenaphthene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
Acenaphthylene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
Acetophenone	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Aniline	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Anthracene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
4-Aminobiphenyl	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Benzidine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	10.0	3.0
Benzo(a)anthracene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Benzo(b)fluoranthene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Benzo(k)fluoranthene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Benzo(a)pyrene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Benzyl butyl phthalate	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Bis(2-chloroethyl)ether	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Bis(2-chloroethoxy)methane	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Bis(2-ethylhexyl)phthalate	17.2	13.9	10.5	11.8	35.0	27.4	5.0	3.2	20.7	21.3	34.3	3.0U	20.6	4.9	15.4	6.9	625	3.0	3.0
Bis(2-chlorisopropyl)ether	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
4-Bromophenyl phenyl ether	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
4-Chloroaniline	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0

Table 6.2 Storm Water Chemistry Results: City of Long Beach Storm Water Monitoring Project. (Page 4 of 5)

	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL					DOMINGUEZ GAP			EPA Method		Achieved
ANALYTE	10 Feb '01	23 Feb '01	25 Feb '01	7 Apr '01	26 Jan '01	11 Feb '01	25 Feb '01	7 Apr '01	27 Jan '01	10 Feb '01	23 Feb '01	7 Apr '01	21 Apr '01	13 Feb '01	26 Feb '01	6 Mar '01	Number		Reporting Limit
SEMIVOLATILES (µg/L) (continued)																			
1-Chloronaphthalene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
2-Chloronaphthalene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
4-Chlorophenyl phenyl ether	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Chrysene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
p-Dimethylaminoazobenzene	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
7,12-Dimethylbenz(a)-anthracene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
a-,a-Dimethylphenethylamine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Dibenz(a,j)acridine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Dibenz(a,h)anthracene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
1,3-Dichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
1,2-Dichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
1,4-Dichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
3,3-Dichlorobenzidine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Diethyl phthalate	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
Dimethyl phthalate	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
Di-n-butylphthalate	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
2,4-Dinitrotoluene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
2,6-Dinitrotoluene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
Diphenylamine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
1,2-Diphenylhydrazine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Di-n-octylphthalate	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Ethyl methanesulfonate	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Endrin ketone	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Fluoranthene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Fluorene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Hexachlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
Hexachlorobutadiene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Hexachlorocyclopentadiene	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Hexachloroethane	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Indeno[1,2,3-cd]pyrene	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
Isophorone	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
3-Methylcholanthrene	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Methyl methanesulfonate	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Naphthalene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
1-Naphthylamine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
2-Naphthylamine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
2-Nitroaniline	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
3-Nitroaniline	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
4-Nitroaniline	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Nitrobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
N-Nitrosodimethylamine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
N-Nitrosodiphenylamine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
N-Nitroso-di-n-propylamine	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
N-Nitrosopiperidine	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Pentachlorobenzene	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Phenacitin	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Phenanthrene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
2-Picoline	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Pronamide	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	625	5.0	5.0
Pyrene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
1,2,4,5-Tetrachlorobenzene	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
1,2,4-Trichlorobenzene	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U	625	1.0	0.5
Benzoic Acid	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	625	10.0	5.0

Table 6.2 Storm Water Chemistry Results: City of Long Beach Storm Water Monitoring Project. (Page 5 of 5)

ANALYTE	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL					DOMINGUEZ GAP			EPA Method Number		Achieved Reporting Limit
	10 Feb '01	23 Feb '01	25 Feb '01	7 Apr '01	26 Jan '01	11 Feb '01	25 Feb '01	7 Apr '01	27 Jan '01	10 Feb '01	23 Feb '01	7 Apr '01	21 Apr '01	13 Feb '01	26 Feb '01	6 Mar '01			
SEMIVOLATILES (µg/L) (continued)																			
Benzyl Alcohol	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	5.0U	625	5.0	5.0
4-Chloro-3-methylphenol	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
2-Chlorophenol	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	625	2.0	2.0
2,4-Dichlorophenol	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	625	2.0	2.0
2,6-Dichlorophenol	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	625	2.0	2.0
2,4-Dimethylphenol	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	625	2.0	2.0
2,4-Dinitrophenol	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
2-Methyl-4,6-dinitrophenol	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
2-Methylphenol	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
4-Methylphenol	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
2-Nitrophenol	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
4-Nitrophenol	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	3.0U	625	3.0	3.0
Pentachlorophenol	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	2.0U	625	2.0	2.0
Phenol	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
2,3,4,6-Tetrachlorophenol	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
2,4,5-Trichlorophenol	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0
2,4,6-Trichlorophenol	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	625	1.0	1.0

SM = Method number from *Standard Methods for the Examination of Water and Wastewater* (APHA 1995).
NS = Not sampled.
"U" Qualifier denotes analyte not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample reporting limit.
"J" Qualifier denotes analyte concentration reported as an estimate.
NA = Not analyzed.
R = Unusable data

Table 6.3. Dry and Wet Weather Bacteria Results for Alamitos Bay Receiving Waters (1999-2000 and 2000-2001)

Date Time	4/10/00[1]	6/21/00[1]	6/29/00[1]	1/26/01[2] 1010	2/10/01[2] 1028	2/23/01[2] 0807	4/7/01[2] 0900	6/5/01[1] 0800
Total Coliform (MPN/100ml)	20	2	7	5000	300	900	500	30
Fecal Coliform (MPN/100ml)	20	2	7	500	170	50	80	8
Streptococcus (MPN/100ml)	3	<1	25	106	860	1000	450	20

1 Dry weather sampling event
2 Wet weather sampling event

6.2 Dry Weather Sampling Results

The NPDES Permit calls for two dry weather inspections and sampling events to be carried out during the summer dry weather period at each of the four mass emission stations as well as samples to be taken at the Alamitos Bay receiving water site. During the 1999-2000 year, the two dry weather inspections/sampling events were done in late June so that the results could be reported in the annual report due 15 July 2000. For the present year, the first of these dry weather inspections/samplings was done at all sites in June 2001 and the results are reported in this annual report. However, it was decided that it would be better to do the second sampling event later in the summer, and the results from this second event will be reported as an addendum to this annual report. The dry weather events monitored during the 1999-2000 and 2000-2001 seasons are summarized in Table 6.4 below.

Table 6.4. Monitored Dry Weather Events, 1999-2001

Station	Dry Event 1 10 Apr. '00	Dry Event 2 21 Jun. '00	Dry Event 3 29 Jun. '00	Dry Event 4 5 Jun.'01	Dry Event 5 TBS[1]
Bouton Creek		X	X	X	X
Belmont Pump		X	X	X	X
Los Cerritos Channel				X	X
Dominguez Gap		X[2]	X[2]	X[2]	X
Alamitos Bay	X	X	X	X	X

1 TBS: To be sampled in July or August 2001.
2 Intake to basin was observed to be dry. Therefore, no samples were collected.

6.2.1 Basin 14: Dominguez Gap Monitoring Site

An inspection for dry weather flow was conducted at the Dominguez Gap Pump Station on 1 June 2001. No dry weather flow was observed. The basin in front of the pump house had approximately 7 inches of standing water in it. The source of this ponded water was not determined due to the lack of flow from any source. The concrete lined channel that extends east from, and discharges into, the basin had small, isolated pools of standing water, but there was no flow. There is construction activity taking place on the railroad bridge that is north of the pump house. An earth dam has been placed across the basin just north of the pump house to provide convenient vehicle access to the east side of the swale. This dam prevents any flow from the north part of the basin from reaching the pump house. Contrary to what was observed during the dry weather inspections in June 2000, it is apparent that water from the Los Angeles River is not being diverted into the swale for ground water recharge in 2001.

6.2.2 Basin 20: Bouton Creek Monitoring Site

Bouton Creek was sampled on 5 June 2001 from 4:00 a.m. to 8:00 a.m. This time corresponded to a period of low tide when the flow in the creek was not impeded by seawater backing into the creek. The tide levels at this time were between negative 0.05 and plus 1.0 feet in the Long Beach area. This assured that the flow was fresh water flowing downstream in the creek and that that saline tidal water did not commingle with the dry weather discharge of fresh water.

Every 30 minutes during the four-hour period 2.25-liter aliquots of water were pumped from the creek using the automatic sampler installed at the site. An aliquot was deposited into each of five 20-liter borosilicate glass bottles. At the conclusion of the sampling, grab samples for MTBE, TPH, and bacteria were collected. All samples were chilled to 4° C, and transported to the appropriate laboratory for analysis. Conductivity and pH measurements were also taken at this time and these field measurements are summarized in Table 6.5. Results of the chemical analysis of this dry weather sample for the constituents given in Table 4.2 are shown in Table 6.6.

6.2.3 Basin 23: Belmont Pump Station Monitoring Site

Time weighted composite sampling was conducted over a 24 hours period starting on 4 June 2001 and ending on 5 June 2001. Samples were collected from the sump using the automated sampler installed outside of the pump house. Samples were collected into four 20-liter bottles. Every half-hour for the 24 hours, an aliquot of approximately 1.67 liters of water was pumped from the sump into a 20-liter bottle. The bottles were change every six hours and chilled to 4°C with ice during sampling and transportation. Following completion of the sampling, the four bottles of water were combined into a composite. Upon completion of the 24-hour sampling, on 5 June 2001 at 10:30 a.m., grab samples for MTBE, TPH, and bacteria were manually collected from the sump. All samples were chilled to 4° C and transported to the appropriate laboratory for analysis. The field measurements are summarized in Table 6.5. Results of the chemical analysis of this dry weather sample for the constituents given in Table 4.2 are shown in Table 6.6.

6.2.4 Basin 27: Los Cerritos Channel Monitoring Site

Time weighted sampling was conducted over a 24-hour period of the water flowing through the channel. Sampling was started on 4 June and completed on 5 June 2001. Samples were taken from the middle of the channel using the automated sampler installed on the bank of the channel. The dry weather flow is a narrow stream approximately 22 feet wide and 2 inches located in the middle of the channel. To reach the water, the sampling hose that is used for sampling storm water was extended an additional 33 feet. Every half-hour for 24 hours, an aliquot of approximately 1.67 liters of water was pumped into a 20-liter bottle. The bottles were change every six hours and chilled to 4°C with ice during sampling and transportation. Following completion of the sampling, the four bottles of water were combined into a composite sample. After completion of the 24-hour sampling, on June 5 at 9:35 a.m., grab samples were manually collected for MTBE, TPH, and bacteria. All samples were chilled to 4° C, and transported to the appropriate laboratory for analysis. The field measurements are summarized in Table 6.5. Results of the chemical analysis of this dry weather sample for the constituents given in Table 4.2 are shown in Table 6.6.

6.2.5 Basin 23: Alamitos Bay Receiving Water Monitoring Site

Samples of water were collected at the Alamitos Bay Receiving Water Site occupied during the wet season in the vicinity of the pump station outfall from Basin 24. The samples were collected from the end of the swimming dock just north of the outfall. Sampling was done on the morning of June 5, 2001 at 9:15 a.m. The outfall has a low-flow diverter that prevents dry weather flow from being discharged into the Bay. Samples for toxicity testing were collected in 1-gallon cubitainers by dipping them approximately one foot below the surface. In addition, grab-samples for bacteria and chemical analyses were also collected from the same site. All samples were cooled to 4° C and transported to the appropriate laboratories for analysis. Results of the bacterial analyses for these dry weather samples are summarized in Table 6.3.

Table 6.5. Field Measurements for Bouton Creek, Belmont Pump, and Los Cerritos Channel, Dry Weather Season (1999-2000 and 2000-2001).

	Bouton Creek			Belmont Pump			Los Cerritos
Date	**6/21/00**	**6/29/00**	**6/5/01**	**6/21/00**	**6/29/00**	**6/5/01**	**6/5/01**
Time	**0737**	**1100**	**0825**	**1200**	**1130**	**1030**	**0935**
Temperature (°C)	21.6	30.6	19.7	21.6	22.6	20.3	20.2
PH	8.79	9.85	8.50	8.14	8.24	8.20	8.88
Conductivity (mS/cm)	1.57	2.88	8.06	2.66	2.60	2.57	0.79
Flow (cfs)	0.6[1]	1.75[1]	2.86[4]	0.086[6]	0.052[6]	0.038[6]	5.2[1]
Dissolved Oxygen (mg/L)	>7.4[2,3]	>7.4[2,3]	14[5]	7.2[3]	7.2[3]	12[5]	13[5]

1 Flow was determined by measuring the depth and width of the water channel, as well as the velocity of a floating object in the water.
2 Value based on 100% saturation conditions, measured temperature and salinity values.
3 Dissolved oxygen measurements could not be determined due to equipment malfunction. Result shown was taken on 7/10/00.
4 The flow rate was determined with the KLASS flowmeter installed at the station.
5 Dissolved oxygen measurements could not be determined due to equipment malfunction. Result shown was taken on 6/11/01.
6 The flow rate was determined by observing changes in water level in the sump area over a 24-hour period.

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Table 6.6 Summary of Chemical Analyses of Dry Weather Monitoring, 1999-2000 and 2000-2001. (Page 1 of 5)

	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL		Achieved Reporting	Achieved Reporting
ANALYTE	21 Jun 2000	29 Jun 2000	5 Jun 2001	Aug 2001	21 Jun 2000	29 Jun 2000	5 Jun 2001	Aug 2001	5 Jun 2001	Aug 2001	Limit - 1999/2000	Limit - 2000/2001
CONVENTIONALS												
Oil and Grease (mg/L)	5.0U	5.0U	5.0U	NS	5.0U	5.0U	5.0U	NS	5.0U	NS	5.0	5.0
Total Phenols	0.1U	0.1U	0.1U	NS	0.1U	0.1U	0.1U	NS	0.1U	NS	0.1	0.1
Cyanide (µg/L)	5.0U	5.0U	5.0U	NS	5.0U	5.0U	5.0U	NS	5.0U	NS	5	5.0
pH (units)	8.5	8.6	8.3	NS	9.3	9.8	7.9	NS	9.4	NS	0.01	NA
Dissolved Phosphorous (mg/L)	0.82	0.77	0.74	NS	0.68	0.62	0.087	NS	0.045	NS	0.05	0.0
Total Phosphorous (mg/L)	0.88	0.95	0.92	NS	0.84	0.81	0.042	NS	0.22	NS	0.05	0.0
Turbidity (NTU)	2.4	1.8	18	NS	4.3	2.3	9.8	NS	16	NS	0.1	0.1
Total Suspended Solids (mg/L)	2.0	1.0U	8	NS	24	1.0U	14	NS	14	NS	1.0	1.0
Total Dissolved Solids (mg/L)	1700	1700	1700	NS	860	1500	8200	NS	590	NS	1.0	1.0
Volatile Suspended Solids (mg/L)	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Total Organic Carbon (mg/L)	8.5	8.9	9.4U	NS	12	12	5.7U	NS	24U	NS	1.0	1.0
Total Recoverable Petroleum Hydrocarbon (mg/L)	5.0U	5.0U	5.0U	NS	5.0U	5.0U	5.0U	NS	5.0U	NS	5.0	5.0
Biochemical Oxygen Demand (mg/L)	5.0U	5.0U	5.0U	NS	5.0U	5.0U	8.8	NS	27	NS	5.0	5.0
Chemical Oxygen Demand (mg/L)	58	61	71U	NS	68	82	3700	NS	130U	NS	20	4.0
Total Ammonia-Nitrogen (mg/L)	0.11	0.1U	0.48	NS	0.1U	0.17	0.1U	NS	0.74	NS	0.1	0.1
Total Kjeldahl Nitrogen (mg/L)	1.8	1.3	1.4	NS	1.6	1.3	1.5	NS	3.4	NS	0.1	0.1
Nitrite (mg/L)	NP	NP	0.2U	NS	NP	NP	0.2U	NS	0.2U	NS	NP	0.2
Nitrate (mg/L)	0.48	0.1U	0.79	NS	0.1U	1.0	0.1U	NS	0.058	NS	0.1	0.01-0.1
Alkalinity (mg/L)	450	460	430	NS	280	270	130	NS	130	NS	2.0	0.1
Specific Conductance (umhos/cm)	2900	2800	2600	NS	1500	2500	13000	NS	830	NS	1.0	1.0
Total Hardness (mg/L)	340	340	340	NS	240	320	1500	NS	160	NS	1.0	1.0
MBAS (mg/L)	0.5U	0.5U	0.037	NS	0.5U	0.5U	0.032	NS	0.047	NS	0.5	0.0
Chloride (mg/L)	580	550	550	NS	290	590	4400	NS	110	NS	2.0	1.0
Fluoride (mg/L)	2.4	1.9	1.6	NS	1.1	0.97	0.89	NS	0.76	NS	0.1	2.0
Sulfate (mg/L)	180	190	260	NS	110	140	940	NS	130	NS	2.0	0.1
Methyl tertiary butyl ether (MTBE)	2.1	1.0U	1U	NS	1.0U	1.0U	1U	NS	1U	NS	1.0	1.0
BACTERIA (mpn/100 mL)												
Total Coliform	900	7000	9000	NS	>1600	30	30000	NS	>160000	NS	2.0	2.0
Fecal Coliform	110	5000	800	NS	1600	23	80	NS	13000	NS	2.0	2.0
Fecal Streptococcus	660	1496	117	NS	130	453	260	NS	864	NS	1.0	1.0
TOTAL METALS (µg/L)												
Aluminum	50U	50U	370	NS	50U	50U	57	NS	27	NS	50	25.0
Arsenic	3.8	2.4	4.5U	NS	3.0	3.7	2.7U	NS	1.4U	NS	1.0	0.5
Beryllium	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Cadmium	0.5U	0.5U	0.2U	NS	0.5U	0.5U	1.5	NS	1.1	NS	0.5	0.2
Chromium	2.1	1.0U	15	NS	1.0U	1.8	9.8	NS	4.3	NS	1.0	1.0
Copper	13	20	7.7U	NS	15	8.6	17	NS	19	NS	1.0	1.0
Hexavalent Chromium (mg/L)	0.01U	0.01U	0.02U	NS	0.01U	0.01U	0.02U	NS	0.02U	NS	0.01	0.02
Iron	220	79	620	NS	160	210	260	NS	70	NS	50	25.0
Lead	3.5	5.0	4.5	NS	5.0	2.7	4.2	NS	3.1	NS	1.0	1.0
Mercury	0.2U	0.23	0.2U	NS	0.2U	0.2U	0.2U	NS	0.2U	NS	0.2	0.2
Nickel	3.6	3.6	13	NS	2.7	3	17	NS	11	NS	1.0	2.0
Zinc	27	42	24	NS	43	20	26	NS	23	NS	10	5.0
DISSOLVED METALS (µg/L)												
Aluminum	50U	50U	25U	NS	50U	50U	25U	NS	27	NS	50	25.0
Arsenic	3.8	2.4	3.9U	NS	3.0	3.8	2.3U	NS	1.2U	NS	1.0	0.5
Beryllium	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Cadmium	0.5U	0.5U	0.2U	NS	0.5U	0.53	0.2U	NS	0.2U	NS	0.5	0.2
Chromium	1.7	1.0U	11	NS	1.0U	1.6	6.1	NS	2.8	NS	1.0	1.0

Table 6.6 Summary of Chemical Analyses of Dry Weather Monitoring, 1999-2000 and 2000-200. (Page 2 of 5)

ANALYTE	BELMONT PUMP 21 Jun 2000	BELMONT PUMP 29 Jun 2000	BELMONT PUMP 5 Jun 2001	BELMONT PUMP Aug 2001	BOUTON CREEK 21 Jun 2000	BOUTON CREEK 29 Jun 2000	BOUTON CREEK 5 Jun 2001	BOUTON CREEK Aug 2001	LOS CERRITOS CHANNEL 5 Jun 2001	LOS CERRITOS CHANNEL Aug 2001	Achieved Reporting Limit - 1999/2000	Achieved Reporting Limit - 2000/2001
DISSOLVED METALS (µg/L) (continued)												
Copper	8.2	15	3.4	NS	8.7	5.2	5.4	NS	14	NS	1.0	1.0
Iron	110	59	25U	NS	50U	96	100	NS	25U	NS	50	25.0
Lead	1.6	2.8	1.4	NS	2.2	1.0U	1.0U	NS	2.4	NS	1.0	1.0
Mercury	0.2U	0.2U	0.2U	NS	0.2U	0.2U	0.2U	NS	0.2U	NS	0.2	0.2
Nickel	3.5	2.8	11	NS	2.5	2.9	11	NS	8.6	NS	1.0	2.0
Zinc	6.9	32	13	NS	30	10U	11	NS	13	NS	10	5.0
CHLORINATED PESTICIDES (µg/L)												
Aldrin	0.05U	0.05U	0.05U	NS	0.05U	0.05U	0.05U	NS	0.05U	NS	0.05	0.05
Alpha-BHC	0.05U	0.05U	0.05U	NS	0.05U	0.05	0.05U	NS	0.05U	NS	0.05	0.05
beta-BHC	0.05U	0.05U	0.05U	NS	0.05U	0.05U	0.05U	NS	0.05U	NS	0.05	0.05
Delta-BHC	0.05U	0.05U	0.05U	NS	0.05U	0.05U	0.05U	NS	0.05U	NS	0.05	0.05
gamma-BHC (lindane)	0.05U	0.05U	0.05U	NS	0.05U	0.08	0.05U	NS	0.05U	NS	0.05	0.05
Alpha-Chlordane	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
gamma-Chlordane	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
4,4'-DDD	0.02U	0.02U	0.05U	NS	0.02U	0.02U	0.05U	NS	0.05U	NS	0.02	0.05
4,4'-DDE	0.02U	0.02U	0.05U	NS	0.02U	0.02U	0.05U	NS	0.05U	NS	0.02	0.05
4,4'-DDT	0.02U	0.02U	0.1U	NS	0.02U	0.02U	0.1U	NS	0.1U	NS	0.02	0.1
Dieldrin	0.1U	0.1U	0.1U	NS	0.1U	0.1U	0.1U	NS	0.1U	NS	0.1	0.1
Endosulfan I	0.05U	0.05U	0.05U	NS	0.05U	0.05U	0.05U	NS	0.05U	NS	0.05	0.05
Endosulfan II	0.1U	0.1U	0.05U	NS	0.1U	0.1U	0.05U	NS	0.05U	NS	0.1	0.05
Endosulfan sulfate	0.1U	0.1U	0.1U	NS	0.1U	0.1U	0.1U	NS	0.1U	NS	0.1	0.1
Endrin	0.1U	0.1U	0.1U	NS	0.1U	0.1U	0.1U	NS	0.1U	NS	0.1	0.1
Endrin Aldehyde	0.1U	0.1U	0.1U	NS	0.1U	0.1U	0.1U	NS	0.1U	NS	0.1	0.1
Endrin Ketone	0.1U	0.1U	0.1U	NS	0.1U	0.1U	0.1U	NS	0.1U	NS	0.1	0.1
Heptachlor	0.05U	0.05U	0.05U	NS	0.05U	0.05U	0.05U	NS	0.05U	NS	0.05	0.05
Heptachlor Epoxide	0.05U	0.05U	0.05U	NS	0.05U	0.05U	0.05U	NS	0.05U	NS	0.05	0.05
Methoxychlor	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
Toxaphene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Total PCBs	NP	NP	1.0U	NS	NP	NP	1.0U	NS	1.0U	NS	1.0	1.0
CARBAMATE & UREA PESTCIDES (µg/L)												
Oxamyl	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Methoamyl	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Phenuron	NP	NP	4U	NS	NP	NP	4U	NS	4U	NS	NP	4
Monuron	NP	NP	4U	NS	NP	NP	4U	NS	4U	NS	NP	4
Propoxur	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Carbofuran	40U	40U	10U	NS	40U	40U	10U	NS	10U	NS	40	10
Carbaryl	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Flumeturon	NP	NP	4U	NS	NP	NP	4U	NS	4U	NS	NP	4
Diuron	4.0U	4.0U	4U	NS	4.0U	4.0U	4U	NS	4U	NS	4.0	4
Propham	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Siduron	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Methiocarb	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Linuron	NP	NP	4U	NS	NP	NP	4U	NS	4U	NS	NP	4
Swep	NP	NP	4U	NS	NP	NP	4U	NS	4U	NS	NP	4
Chlorprophan	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Brabane	NP	NP	10U	NS	NP	NP	10U	NS	10U	NS	NP	10
Neburon	NP	NP	4U	NS	NP	NP	4U	NS	4U	NS	NP	4
AROCLORS (µg/L)												
Aroclor-1016	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0

Table 6.6 Summary of Chemical Analyses of Dry Weather Monitoring, 1999-2000 and 2000-2001. (Page 3 of 5)

ANALYTE	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL		Achieved Reporting Limit - 1999/2000	Achieved Reporting Limit - 2000/2001
	21 Jun 2000	29 Jun 2000	5 Jun 2001	Aug 2001	21 Jun 2000	29 Jun 2000	5 Jun 2001	Aug 2001	5 Jun 2001	Aug 2001		
AROCLORS (µg/L) (continued)												
Aroclor-1221	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Aroclor-1232	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Aroclor-1242	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Aroclor-1248	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Aroclor-1254	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Aroclor-1260	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
ORGANOPHOSPHATE PESTICIDES (µg/L)												
Azinphos methyl	NP	NP	1.0U	NS	NP	NP	1.0U	NS	1.0U	NS	NP	1.0
Bolstar	NP	NP	0.05U	NS	NP	NP	0.05U	NS	0.05U	NS	NP	0.05
Coumaphos	NP	NP	1.0U	NS	NP	NP	1.0U	NS	1.0U	NS	NP	1.0
Demeton O & S	NP	NP	0.1U	NS	NP	NP	0.1U	NS	0.1U	NS	NP	0.1
Diazinon	1.0U	2.0	0.08	NS	1.0U	1.0U	0.01	NS	0.22	NS	1.0	0.01
Dicholorvoz	NP	NP	0.1U	NS	NP	NP	0.1U	NS	0.1U	NS	NP	0.1
Disulfoton	NP	NP	0.1UJ	NS	NP	NP	0.1UJ	NS	0.1UJ	NS	NP	0.1
Dursban (chlorpyrifos)	1.0U	1.0U	0.05U	NS	1.0U	1.0U	0.05U	NS	0.05U	NS	1.0	0.05
Ethoprop	NP	NP	0.05U	NS	NP	NP	0.05U	NS	0.05U	NS	NP	0.05
Fensulfothion	NP	NP	0.1U	NS	NP	NP	0.1U	NS	0.1U	NS	NP	0.1
Fenthion	NP	NP	0.1U	NS	NP	NP	0.1U	NS	0.1U	NS	NP	0.1
Merphos	NP	NP	0.05U	NS	NP	NP	0.05U	NS	0.05U	NS	NP	0.05
Malathion	1.0U	1.0U	0.1U	NS	1.0U	1.0U	0.1U	NS	0.1U	NS	1.0	0.1
Mevinphos	NP	NP	0.1U	NS	NP	NP	0.1U	NS	0.1U	NS	NP	0.1
Parathion methyl	NP	NP	0.05U	NS	NP	NP	0.05U	NS	0.05U	NS	NP	0.05
Phorate	NP	NP	0.1U	NS	NP	NP	0.1U	NS	0.1U	NS	NP	0.1
Ronnel	NP	NP	0.1U	NS	NP	NP	0.1U	NS	0.1U	NS	NP	0.1
Stirophos	NP	NP	0.05U	NS	NP	NP	0.05U	NS	0.05U	NS	NP	0.05
Tokuthion	NP	NP	0.05U	NS	NP	NP	0.05U	NS	0.05U	NS	NP	0.05
Tricholronate	NP	NP	0.1U	NS	NP	NP	0.1U	NS	0.1U	NS	NP	0.1
Prometryn	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Atrazine	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Simazine	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Cyanazine	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
HERBICIDES (µg/L)												
Dalapon	NP	NP	2U	NS	NP	NP	2U	NS	2U	NS	NP	2.0
Dicamba	NP	NP	0.5U	NS	NP	NP	0.5U	NS	0.5U	NS	NP	0.5
MCPP	NP	NP	250U	NS	NP	NP	250U	NS	250U	NS	NP	250
MCPA	NP	NP	250U	NS	NP	NP	250U	NS	250U	NS	NP	250
Dichlorprop	NP	NP	1U	NS	NP	NP	1U	NS	1U	NS	NP	1.0
2,4-D	1.0U	1.0U	1U	NS	1.0U	1.0U	1U	NS	6.4	NS	1.0	1.0
2,4,5-TP-Silvex	5.0U	5.0U	0.5U	NS	5.0U	5.0U	0.5U	NS	0.5U	NS	5.0	0.5
2,4,5-T	NP	NP	0.5U	NS	NP	NP	0.5U	NS	0.5U	NS	NP	0.5
2,4,5-DB	NP	NP	1U	NS	NP	NP	1U	NS	1U	NS	NP	1.0
Dinoseb	NP	NP	0.5U	NS	NP	NP	0.5U	NS	0.5U	NS	NP	0.5
Benzaton	1.0U	1.0U	1U	NS	1.0U	1.0U	1U	NS	1U	NS	1.0	1.0
Glyphosate	5.0U	5.0U	5U	NS	5.0U	5.0U	5U	NS	5U	NS	5.0	5.0
Molinate	0.25U	0.25U	NP	NS	0.25U	0.25U	NP	NS	NP	NS	0.25	NA
Thiobencarb	0.25U	0.25U	NP	NS	0.25U	0.25U	NP	NS	NP	NS	0.25	NA
SEMI-VOLATILES (µg/L)												
Acenaphthene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
Acenaphthylene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5

Table 6.6 Summary of Chemical Analyses of Dry Weather Monitoring, 1999-2000 and 2000-2001. (Page 4 of 5)

ANALYTE	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL		Achieved Reporting Limit - 1999/2000	Achieved Reporting Limit - 2000/2001
	21 Jun 2000	29 Jun 2000	5 Jun 2001	Aug 2001	21 Jun 2000	29 Jun 2000	5 Jun 2001	Aug 2001	5 Jun 2001	Aug 2001		
SEMI-VOLATILES (µg/L) (continued)												
Acetophenone	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Aniline	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Anthracene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
4-Aminobiphenyl	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Benzidine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Benzo(a)anthracene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Benzo(b)fluoranthene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Benzo(k)fluoranthene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Benzo(a)pyrene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Benzyl butyl phthalate	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Bis(2-chloroethyl)ether	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Bis(2-chloroethoxy)methane	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Bis(2-ethylhexyl)phthalate	4.2	3.1	84.4	NS	3.0U	10.3	3.6	NS	4.6	NS	3.0	3.0
Bis(2-chlorisopropyl)ether	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
4-Bromophenyl phenyl ether	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
4-Chloroaniline	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
1-Chloronaphthalene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
2-Chloronaphthalene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
4-Chlorophenyl phenyl ether	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Chrysene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
p-Dimethylaminoazobenzene	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
7,12-Dimethylbenz(a)-anthracene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
a-,a-Dimethylphenethylamine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Dibenz(a,j)acridine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Dibenz(a,h)anthracene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
1,4-Dichlorobenzene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
1,3-Dichlorobenzene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
1,2-Dichlorobenzene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
3,3-Dichlorobenzidine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Diethyl phthalate	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	3.2	NS	0.5	0.5
Dimethyl phthalate	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
Di-n-butylphthalate	3.0U	3.0U	4.5	NS	3.0U	3.0U	4.7	NS	3.9	NS	3.0	3.0
2,4-Dinitrotoluene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
2,6-Dinitrotoluene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
Diphenylamine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
1,2-Diphenylhydrazine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Di-n-octylphthalate	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Ethyl methanesulfonate	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Endrin Ketone	NP	NP	1.0U	NS	NP	NP	1.0U	NS	1.0U	NS	NP	1.0
Fluoranthene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Fluorene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Hexachlorobenzene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
Hexachlorobutadiene	0.5U	0.5U	1.0U	NS	0.5U	0.5U	1.0U	NS	1.0U	NS	1.0	1.0
Hexachlorocyclopentadiene	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Hexachloroethane	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Indeno[1,2,3-cd]pyrene	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
Isophorone	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
3-Methylcholanthrene	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Methyl methanesulfonate	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0

Table 6.6 Summary of Chemical Analyses of Dry Weather Monitoring, 1999-2000 and 2000-2001. (Page 5 of 5)

ANALYTE	BELMONT PUMP				BOUTON CREEK				LOS CERRITOS CHANNEL		Achieved Reporting Limit - 1999/2000	Achieved Reporting Limit - 2000/2001
	21 Jun 2000	29 Jun 2000	5 Jun 2001	Aug 2001	21 Jun 2000	29 Jun 2000	5 Jun 2001	Aug 2001	5 Jun 2001	Aug 2001		
SEMI-VOLATILES (µg/L) (continued)												
Napthalene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
1-Naphthylamine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
2-Naphthylamine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
2-Nitroaniline	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
3-Nitroaniline	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
4-Nitroaniline	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Nitrobenzene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
N-Nitrosodimethylamine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
N-Nitrosodiphenylamine	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
N-Nitroso-di-n-propylamine	NA	NA	1.0U	NS	NA	NA	1.0U	NS	1.0U	NS	1.0	1.0
N-Nitrosopiperidine	1.0U	1.0U	3.0U	NS	1.0U	1.0U	3.0U	NS	3.0U	NS	3.0	3.0
Pentachlorobenzene	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Phenacitin	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Phenanthrene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
2-Picoline	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Pronamide	5.0U	5.0U	5.0U	NS	5.0U	5.0U	5.0U	NS	5.0U	NS	5.0	5.0
Pyrene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
1,2,4,5-Tetrachlorobenzene	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
1,2,4-Trichlorobenzene	0.5U	0.5U	0.5U	NS	0.5U	0.5U	0.5U	NS	0.5U	NS	0.5	0.5
Benzoic Acid	5.0U	5.0U	5.0U	NS	5.0U	5.0U	5.0U	NS	5.0U	NS	5.0	5.0
Benzyl Alcohol	5.0U	5.0U	5.0U	NS	5.0U	5.0U	5.0U	NS	5.0U	NS	5.0	5.0
4-Chloro-3-methylphenol	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
2-Chlorophenol	2.0U	2.0U	2.0U	NS	2.0U	2.0U	2.0U	NS	2.0U	NS	2.0	2.0
2,4-Dichlorophenol	2.0U	2.0U	2.0U	NS	2.0U	2.0U	2.0U	NS	2.0U	NS	2.0	2.0
2,6-Dichlorophenol	2.0U	2.0U	2.0U	NS	2.0U	2.0U	2.0U	NS	2.0U	NS	2.0	2.0
2,4-Dimethylphenol	2.0U	2.0U	2.0U	NS	2.0U	2.0U	2.0U	NS	2.0U	NS	2.0	2.0
2,4-Dinitrophenol	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
2-Methyl-4,6-dinitrophenol	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
2-Methylphenol	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
4-Methylphenol	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
2-Nitrophenol	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
4-Nitrophenol	3.0U	3.0U	3.0U	NS	3.0U	3.0U	3.0U	NS	3.0U	NS	3.0	3.0
Pentachlorophenol	2.0U	2.0U	2.0U	NS	2.0U	2.0U	2.0U	NS	2.0U	NS	2.0	2.0
Phenol	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
2,3,4,6-Tetrachlorophenol	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
2,4,5-Trichlorophenol	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0
2,4,6-Trichlorophenol	1.0U	1.0U	1.0U	NS	1.0U	1.0U	1.0U	NS	1.0U	NS	1.0	1.0

"U" Qualifier denotes analyte not detected above the level of the associated value. The associated value is either the sample quantitation limit or the sample reporting limit.
NA = Data is not available.
NS = Station has not yet been sampled.
NP = Analysis was not performed.

7.0 TOXICITY RESULTS

Toxicity tests were conducted on sub-samples of the composites collected for chemical analysis. All samples were collected under wet weather conditions between 27 January 2001 and 21 April 2001. The toxicity tests were initiated within 5 and 101 hours of sample collection (Appendix Table A2-2).

7.1 Wet Weather Discharge

7.1.1 Belmont Pump Station

Composite samples were collected from the Belmont pump station during four separate storm events and were tested with three species, the water flea (freshwater crustacean), mysid (marine crustacean), and sea urchin (marine). The first sample was collected from this station on 10 February 2001. This sample caused toxic effects to the water flea and sea urchin fertilization (Table 7.1), with the fertilization test being the most sensitive (Figure 7.1). Both the water flea survival and reproduction endpoints showed a similar degree of response (Table 7.1), however the reproduction endpoint showed an enhancement well above control for all but the highest concentration (Figure 7.1). Neither the mysid survival nor growth tests were adversely affected by the sample.

The second sample was collected on 23 February 2001 and produced toxic responses in all three species. Again the sea urchin fertilization test was the most sensitive indicator of toxicity with a 37.2% sample calculated to cause a 50% reduction in fertilization (Table 7.1). Significant reductions in water flea survival and reproduction and mysid survival were found at only the 100% concentration, while mysid growth was significantly reduced at both 100% and 50% concentrations. Water flea survival showed a greater degree of response than did the reproduction endpoint (Figure 7.1).

The third sample was taken on 25 February 2001 and elicited a toxic response only to the water flea (Table 7.1). Significant effects occurred for both survival and reproduction endpoints, which showed similar levels of response (Figure 7.1). All endpoints for the sea urchin fertilization test and mysid test were similar to the control responses.

The fourth and final sample from the Belmont Pump Station was collected 7 April 2001. This was the most toxic of the samples from Belmont pump with the water flea survival being the most sensitive indicator with a median response of 17.7% (Table 7.1). The mysid growth endpoint had the lowest NOEC, but the median response fell between responses for the other species. This was due to the dose/response of this sample being very flat, with similar levels of growth reduction for all the concentrations. For each of the species and endpoints, this sample produced the lowest median response values (indicating greatest toxicity) of all the Belmont samples (Table 7.1).

Table 7.1. Toxicity of Wet Weather Samples Collected from the City of Long Beach Belmont Pump Station During the 2000/2001 Monitoring Season. Test results indicating toxicity are shown in bold type.

Date	Test	Test Response (% sample)				
		NOEC[a]	LOEC[b]	Mysid IC25[c]	Median Response[d]	TUc[e]
2/10/2001	**Water Flea Survival**	**50**	**100**		**70**	**2**
2/10/2001	**Water Flea Reproduction**	**50**	**100**		**78**	**2**
2/10/2001	Mysid Survival	≥100	>100		>100	≤1
2/10/2001	Mysid Growth	≥100	>100	>100		≤1
2/10/2001	**Sea Urchin Fertilization**	**25**	**50**		**>50**	**4**
2/23/2001	**Water Flea Survival**	**50**	**100**		**71**	**2**
2/23/2001	**Water Flea Reproduction**	**50**	**100**		**88**	**2**
2/23/2001	**Mysid Survival**	**50**	**100**		**>100**	**2**
2/23/2001	**Mysid Growth**	**25**	**50**	**>100**		**4**
2/23/2001	**Sea Urchin Fertilization**	**25**	**50**		**37**	**4**
2/25/2001	**Water Flea Survival**	**50**	**100**		**82**	**2**
2/25/2001	**Water Flea Reproduction**	**50**	**100**		**98**	**2**
2/25/2001	Mysid Survival	≥100	>100		>100	≤1
2/25/2001	Mysid Growth	≥100	>100	>100		≤1
2/25/2001	Sea Urchin Fertilization	≥50	>50		>50	≤2
4/7/2001	**Water Flea Survival**	**12**	**25**		**18**	**8**
4/7/2001	**Water Flea Reproduction**	**12**	**25**		**27**	**8**
4/7/2001	**Mysid Survival**	**50**	**100**		**88**	**2**
4/7/2001	**Mysid Growth**	**6**	**12**	**62**		**16**
4/7/2001	**Sea Urchin Fertilization**	**12**	**25**		**37**	**8**

[a] No Observed Effect Concentration: the highest concentration with a test response not significantly different from the control.
[b] Lowest Observed Effect Concentration: the lowest concentration producing a test response that was significantly different from the control.
[c] Concentration causing 25% reduction in mysid growth.
[d] Concentration causing 50% mortality to mysids or water fleas (LC50), 50% inhibition in water flea reproduction (IC50) or 50% reduction in sea urchin fertilization (EC50).
[e] Chronic toxicity units = 100/NOEC.

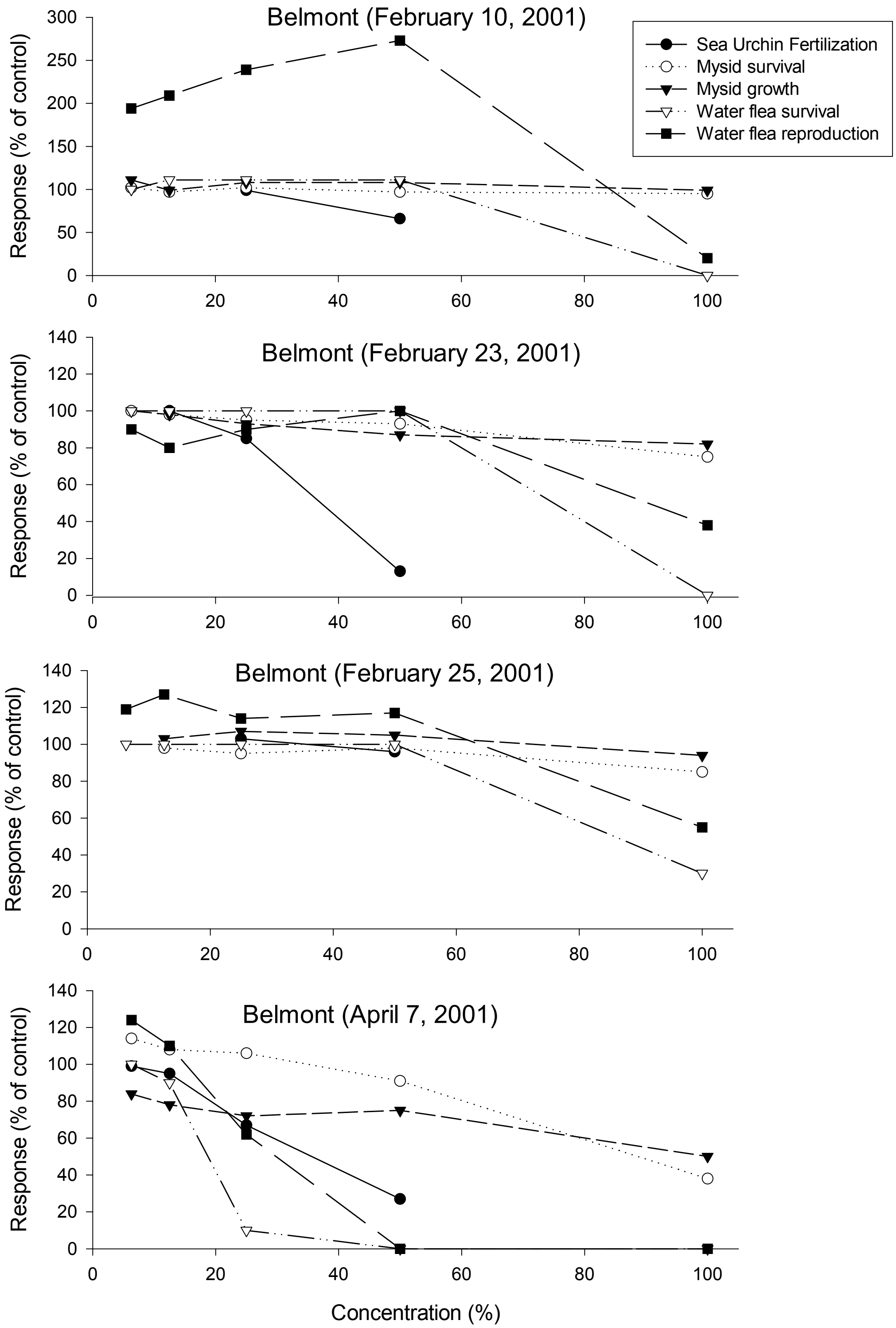


Figure 7.1. Toxicity Dose Response Plots for Storm Water Samples Collected from the Belmont Pump Station.

7.1.2 Bouton Creek

The first sample from the Bouton Creek station was collected on 27 January 2001. Toxicity to this sample was detected by the sea urchin fertilization test and by the growth endpoint of the mysids but not by mysid survival or either water flea endpoint (Table 7.2). The toxic effect to the sea urchins and to mysid growth was relatively weak, with neither endpoint showing a great enough effect for a median response to be calculated (Figure 7.2).

The second Bouton Creek sample was collected on 11 February 2001 and only caused a toxic response to sea urchin fertilization (Table 7.2). While no effect was observed for either of the water flea or mysid endpoints, the effect on sea urchin fertilization was fairly strong with a NOEC of 12.5% and an EC50 of 49.6%. The water flea reproduction endpoint had values for all concentrations that were much greater than for the controls (Figure 7.2).

The third sample collected from Bouton Creek was obtained on 25 February 2001 and elicited a toxic response on water flea survival only (Table 7.2). The sample did not produce any effect on the mysids or sea urchin fertilization and only affected survival at the highest concentration for water flea survival (Figure 7.2). Again, the water flea reproduction endpoint had values for all concentrations that were much greater than for the controls.

The fourth and last sample from Bouton Creek was collected on 7 April 2001. Toxic effects were observed from this sample on all test endpoints except mysid survival (Table 7.2). Due to an instrument malfunction, the aliquot used for testing the mysids was diluted with deionized water and therefore the highest concentration that could be tested was 92% instead of 100%. The sea urchin fertilization test exhibited the greatest sensitivity to this sample with a 38.2% concentration calculated to cause a 50% reduction in fertilization. This sample educed the strongest effect on both the sea urchin and water flea tests of any of the Bouton Creek samples. While the control reproduction for the water fleas was below QA limits (>15 young per female), even if the limits had been met, reproduction for the 12.5% through 50% concentrations were very high, but were significantly different from the controls at the 100% concentration (Figure 7.2). The mysid growth endpoint showed an interrupted dose response in which the 92% and 12% samples were significantly different than the controls, but the intervening concentrations were not. It appeared that the difference for the 12% sample was likely to be spurious and the NOEC was therefore set at 46% (Table 7.2).

Table 7.2. Toxicity of Wet Weather Samples Collected from the City of Long Beach Bouton Creek Station During the 2000/2001 Monitoring Season.
Test results indicating toxicity are shown in bold type.

Date	Test	Test Response (% sample) NOEC[a]	LOEC[b]	Mysid IC25[c]	Median Response[d]	TUc[e]
1/27/2001	Water Flea Survival	≥100	>100		>100	≤1
1/27/2001	Water Flea Reproduction	≥100	>100		>100	≤1
1/27/2001	Mysid Survival	≥100	>100		>100	≤1
1/27/2001	**Mysid Growth**	**50**	**100**	**>100**		**2**
1/27/2001	**Sea Urchin Fertilization**	**25**	**50**		**>50**	**4**
2/11/2001	Water Flea Survival	≥100	>100		>100	≤1
2/11/2001	Water Flea Reproduction	≥100	>100		>100	≤1
2/11/2001	Mysid Survival	≥100	>100		>100	≤1
2/11/2001	Mysid Growth	≥100	>100	>100		≤1
2/11/2001	**Sea Urchin Fertilization**	**12**	**25**		**50**	**8**
2/25/2001	**Water Flea Survival**	**50**	**100**		**81**	**2**
2/25/2001	Water Flea Reproduction	≥100	>100		>100	≤1
2/25/2001	Mysid Survival	≥100	>100		>100	≤1
2/25/2001	Mysid Growth	≥100	>100	>100		≤1
2/25/2001	Sea Urchin Fertilization	≥50	>50		>50	≤2
4/7/2001	**Water Flea Survival**	**25**	**50**		**41**	**4**
4/7/2001	**Water Flea Reproduction**	**50**	**100**		**68**	**2**
4/7/2001	Mysid Survival	≥92	>92		>92	≤1
4/7/2001	**Mysid Growth**	**46[f]**	**92**	**>92**		**2**
4/7/2001	**Sea Urchin Fertilization**	**12**	**25**		**38**	**8**

[a] No Observed Effect Concentration: the highest concentration with a test response not significantly different from the control.
[b] Lowest Observed Effect Concentration: the lowest concentration producing a test response that was significantly different from the control.
[c] Concentration causing 25% reduction in mysid growth.
[d] Concentration causing 50% mortality to mysids or water fleas (LC50), 50% inhibition in water flea reproduction (IC50) or 50% reduction in sea urchin fertilization (EC50).
[e] Chronic toxicity units = 100/NOEC.
[f] Interrupted dose response. 92% and 12% samples were significantly different from controls.

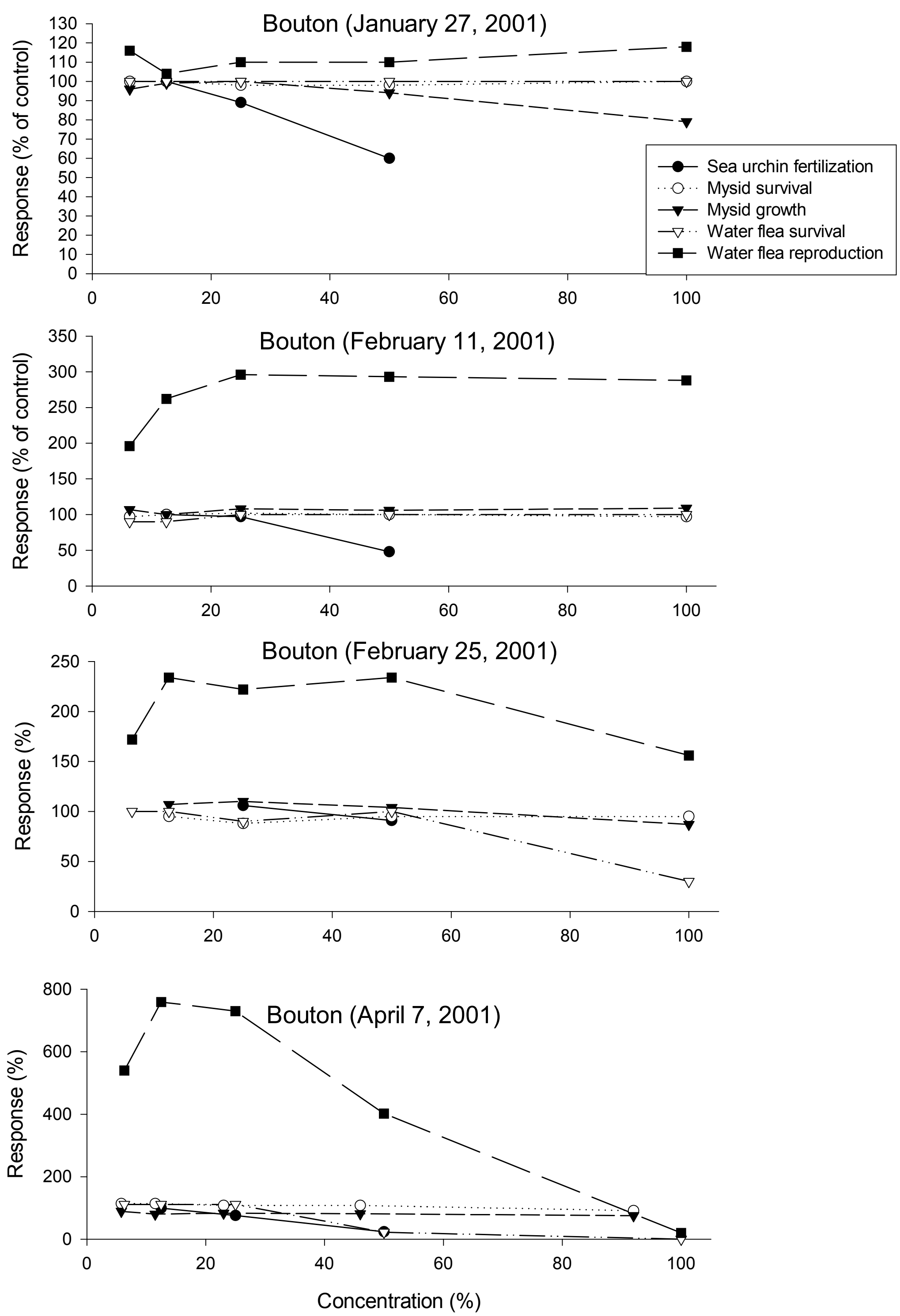


Figure 7.2. Toxicity Dose Response Plots for Storm Water Samples Collected from Bouton Creek.

7.1.3 Los Cerritos Channel

The first of five samples from the Los Cerritos Channel station was collected on 27 January 2001. This sample caused a toxic response to both water flea survival and reproduction, and to the mysid growth and sea urchin fertilization, leaving mysid survival as the only unaffected endpoint (Table 7.3). For each affected endpoint, only the highest concentration showed a significant response and only the water flea endpoints had a greater than 50% response (Figure 7.3).

The second Los Cerritos Channel sample was collected on 10 February 2001 and elicited a toxic response from the water flea survival and reproduction and sea urchin fertilization tests. The median response for all three of these endpoints was similar (Table 7.3). There was no effect on either of the mysid endpoints (Figure 7.3).

The third sampling event for Los Cerritos Channel occurred on 23 February 2001. Only the mysid survival endpoint was not affected by this sample. The sea urchin fertilization test was most strongly affected with a concentration of 30.6% runoff calculated to cause a 50% reduction in fertilization (Table 7.3). For both water flea endpoints and mysid growth, only the highest concentration was significantly effected (Figure 7.3).

The fourth sample from the Los Cerritos Channel station was collected on 7 April 2001 and showed a pattern similar to the first and third samples with effects observed on all endpoints except mysid survival. However, for this sample, water flea survival was the most sensitive indicator with a 37.5% runoff concentration calculated to cause 50% mortality (Table 7.3). Water flea reproduction followed a pattern similar to survival. Toxicity to sea urchin fertilization and mysid growth was only observed at the highest concentration tested (Figure 7.4).

The final Los Cerritos Channel sample was collected 21 April 2001. This sample exhibited the greatest degree of toxicity of any Los Cerritos Channel sample collected. The sea urchin fertilization test was most affected with a concentration of 8.4% runoff calculated to cause a 50% reduction in fertilization (Table 7.3). The lowest concentration tested using the fertilization test showed a significant response (Figure 7.4). Both endpoints of the water flea test also exhibited moderate toxic response. However, mysid survival was only significantly reduced at the highest concentration and the growth endpoint was not affected (Figure 7.4).

Table 7.3. Toxicity of Wet Weather Samples Collected from the City of Long Beach Los Cerritos Channel Station During the 2000/2001 Monitoring Season. Test results indicating toxicity are shown in bold type.

		Test Response (% sample)				
Date	Test	NOEC[a]	LOEC[b]	Mysid IC25[c]	Median Response[d]	TUc[e]
1/27/2001	**Water Flea Survival**	**50**	**100**		**66**	**2**
1/27/2001	**Water Flea Reproduction**	**50**	**100**		**69**	**2**
1/27/2001	Mysid Survival	≥100	>100		>100	≤1
1/27/2001	**Mysid Growth**	**50**	**100**	**>100**		**2**
1/27/2001	**Sea Urchin Fertilization**	**25**	**50**		**>50**	**4**
2/10/2001	**Water Flea Survival**	**25**	**50**		**35**	**4**
2/10/2001	**Water Flea Reproduction**	**25**	**50**		**42**	**4**
2/10/2001	Mysid Survival	≥100	>100		>100	≤1
2/10/2001	Mysid Growth	≥100	>100	>100		≤1
2/10/2001	**Sea Urchin Fertilization**	**12**	**25**		**41**	**8**
2/23/2001	**Water Flea Survival**	**50**	**100**		**71**	**2**
2/23/2001	**Water Flea Reproduction**	**50**	**100**		**90**	**2**
2/23/2001	Mysid Survival	≥100	>100		>100	≤1
2/23/2001	**Mysid Growth**	**50**	**100**	**>100**		**2**
2/23/2001	**Sea Urchin Fertilization**	**12**	**25**		**31**	**8**
4/7/2001	**Water Flea Survival**	**25**	**50**		**38**	**4**
4/7/2001	**Water Flea Reproduction**	**25**	**50**		**38**	**4**
4/7/2001	Mysid Survival	≥100	>100		>100	≤1
4/7/2001	**Mysid Growth**	**50**	**100**	**>100**		**2**
4/7/2001	**Sea Urchin Fertilization**	**25**	**50**		**61**	**4**
4/21/2001	**Water Flea Survival**	**25**	**50**		**33**	**4**
4/21/2001	**Water Flea Reproduction**	**25**	**50**		**38**	**4**
4/21/2001	**Mysid Survival**	**50**	**100**		**>100**	**2**
4/21/2001	Mysid Growth	≥100	>100	>100		≤1
4/21/2001	**Sea Urchin Fertilization**	**<6**	**≤6**		**8**	**>16**

[a] No Observed Effect Concentration: the highest concentration with a test response not significantly different from the control.
[b] Lowest Observed Effect Concentration: the lowest concentration producing a test response that was significantly different from the control.
[c] Concentration causing 25% reduction in mysid growth.
[d] Concentration causing 50% mortality to mysids or water fleas (LC50), 50% inhibition in water flea reproduction (IC50) or 50% reduction in sea urchin fertilization (EC50).
[e] Chronic toxicity units = 100/NOEC.

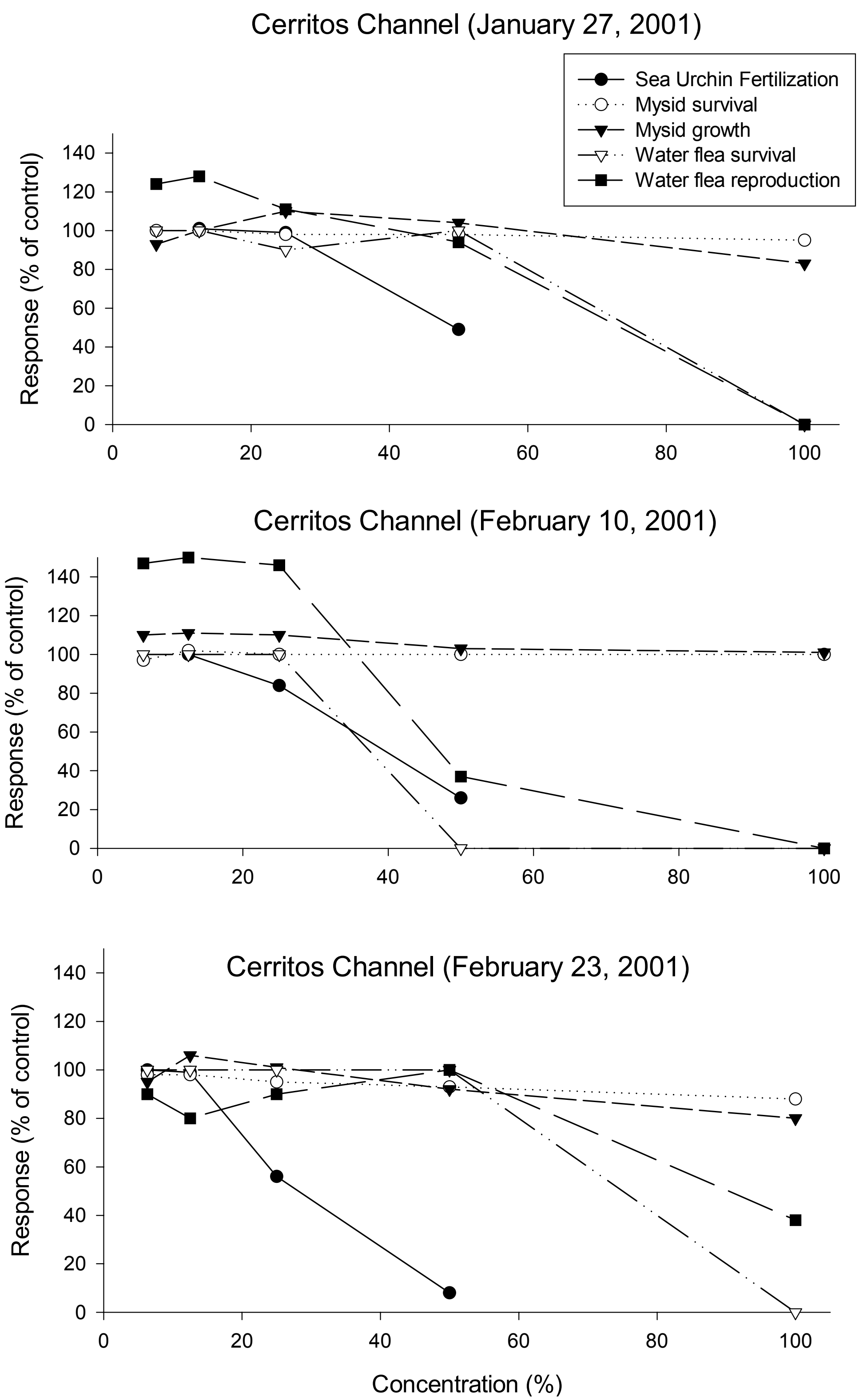
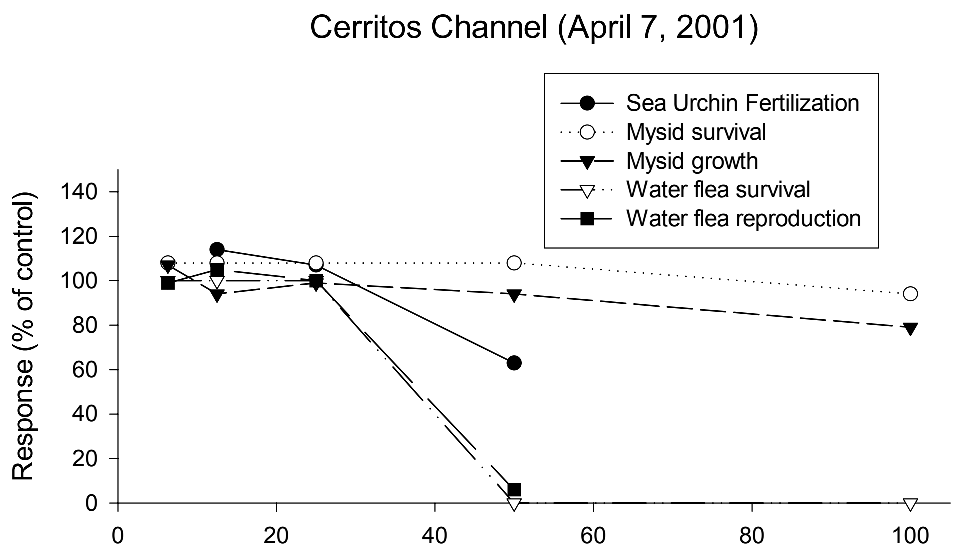


Figure 7.3. Toxicity Dose Response Plots for Storm Water Samples Collected from the Los Cerritos Channel in January and February.



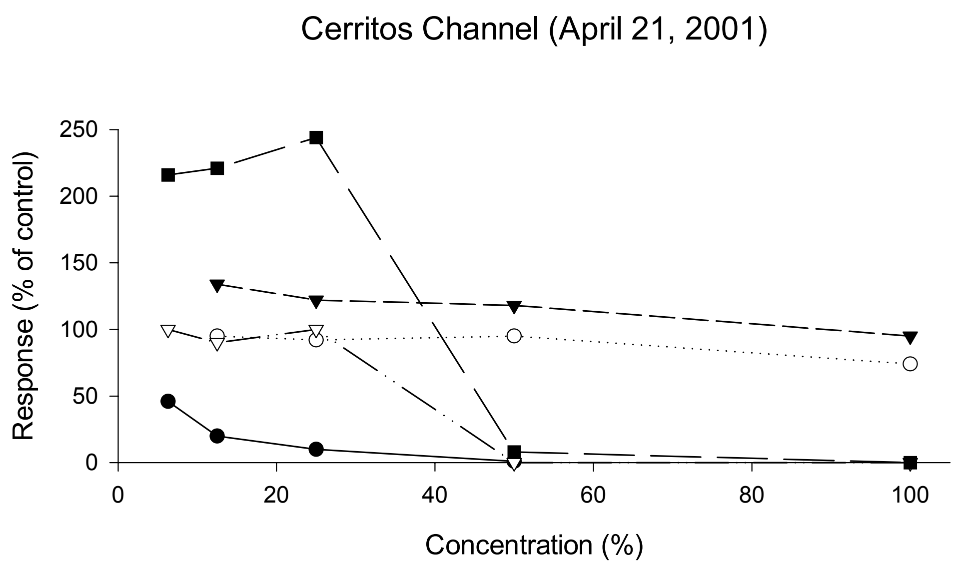


Figure 7.4. Toxicity Dose Response Plots for Storm Water Samples Collected from the Los Cerritos Channel in April.

7.1.4 Dominguez Gap Pump Station

The first of three samples collected from the Dominguez Gap Pump Station was obtained on 13 February 2001. This sample caused a toxic response only to sea urchin fertilization with 42.4% sample calculated to cause a 50% reduction in fertilization (Table 7.4). Both of the end points for the mysid exposures and water flea survival were similar to control response at all concentrations (Figure 7.5). The reproduction endpoint for the water flea did not meet QA requirements (>15 young per female), which may have contributed to there being much greater reproduction in all concentrations than in the control.

The second sample from Dominguez was collected 26 February 2001. This sample did not elicit a toxic response for any of the test species (Table 7.4). There was a small decrease in survival for the water fleas at the highest concentration, but there was no statistical difference from the controls (Figure 7.5).

The third and final sample collected from the Dominguez Gap Pump Station was obtained on 6 March 2001. This sample produced a toxic effect only to sea urchin fertilization (Table 7.4). While the decrease in fertilization was statistically significant, the effect was very small with only a 7% reduction from the controls (Figure 7.5). The statistical significance of this decrease may be an artifact of the extremely low variability of this particular exposure and may not be a reproducible result. Both of the end points for the water flea and mysid exposures were similar to control response at all concentrations (Figure 7.5).

7.1.5 Alamitos Bay Receiving Water

Four grab samples of receiving water from Alamitos Bay were collected during storm events (27 January 2001; 10 February 2001; 23 February 2001 and 7 April 2001). Each sample was tested for toxicity to mysids and sea urchins. Since these samples were saline, the water flea test could not be performed. None of the samples caused toxic effects to mysid survival or sea urchin fertilization. The 23 February sample caused a significant reduction in mysid growth relative to the controls (Table 7.5). The remaining samples did not have a negative effect on mysid growth.

Table 7.4. Toxicity of Wet Weather Samples Collected from the City of Long Beach Dominguez Gap Pump Station During the 2000-2001 Monitoring Season. Test results indicating toxicity are shown in bold type.

Date	Test	Test Response (% sample)				
		NOEC[a]	LOEC[b]	Mysid IC25[c]	Median Response[d]	TUc[e]
2/13/2001	Water Flea Survival	≥100	>100		>100	<1
2/13/2001	Water Flea Reproduction	≥100	>100		>100	<1
2/13/2001	Mysid Survival	≥100	>100		>100	≤1
2/13/2001	Mysid Growth	>100	>100	>100		≤1
2/13/2001	**Sea Urchin Fertilization**	**25**	**50**		**42**	**4**
2/26/2001	Water Flea Survival	≥100	>100		>100	≤1
2/26/2001	Water Flea Reproduction	≥100	>100		>100	≤1
2/26/2001	Mysid Survival	≥100	>100		>100	≤1
2/26/2001	Mysid Growth	≥100	>100	>100		≤1
2/26/2001	Sea Urchin Fertilization	≥50	>50		>50	≤2
3/6/2001	Water Flea Survival	≥100	>100		>100	≤1
3/6/2001	Water Flea Reproduction	≥100	>100		>100	≤1
3/6/2001	Mysid Survival	≥100	>100		>100	≤1
3/6/2001	Mysid Growth	≥100	>100	>100		≤1
3/6/2001	**Sea Urchin Fertilization**	**25**[e]	**50**[e]		**>50**	**4**[f]

[a] No Observed Effect Concentration: the highest concentration with a test response not significantly different from the control.

[b] Lowest Observed Effect concentration: the lowest concentration producing a test response that was significantly different from the control.

[c] Concentration causing 25% reduction in my sid growth.

[d] Concentration causing 50% mortality to mysids or water fleas (LC50), 50% inhibition in water flea reproduction (IC50) or 50% reduction in sea urchin fertilization (EC50).

[e] Chronic toxicity units = 100/NOEC.

[f] Minimal amount of toxicity present (92% fertilization in highest test concentration); detection of statistically significant reduction in fertilization due to extremely low variability of exposure results.

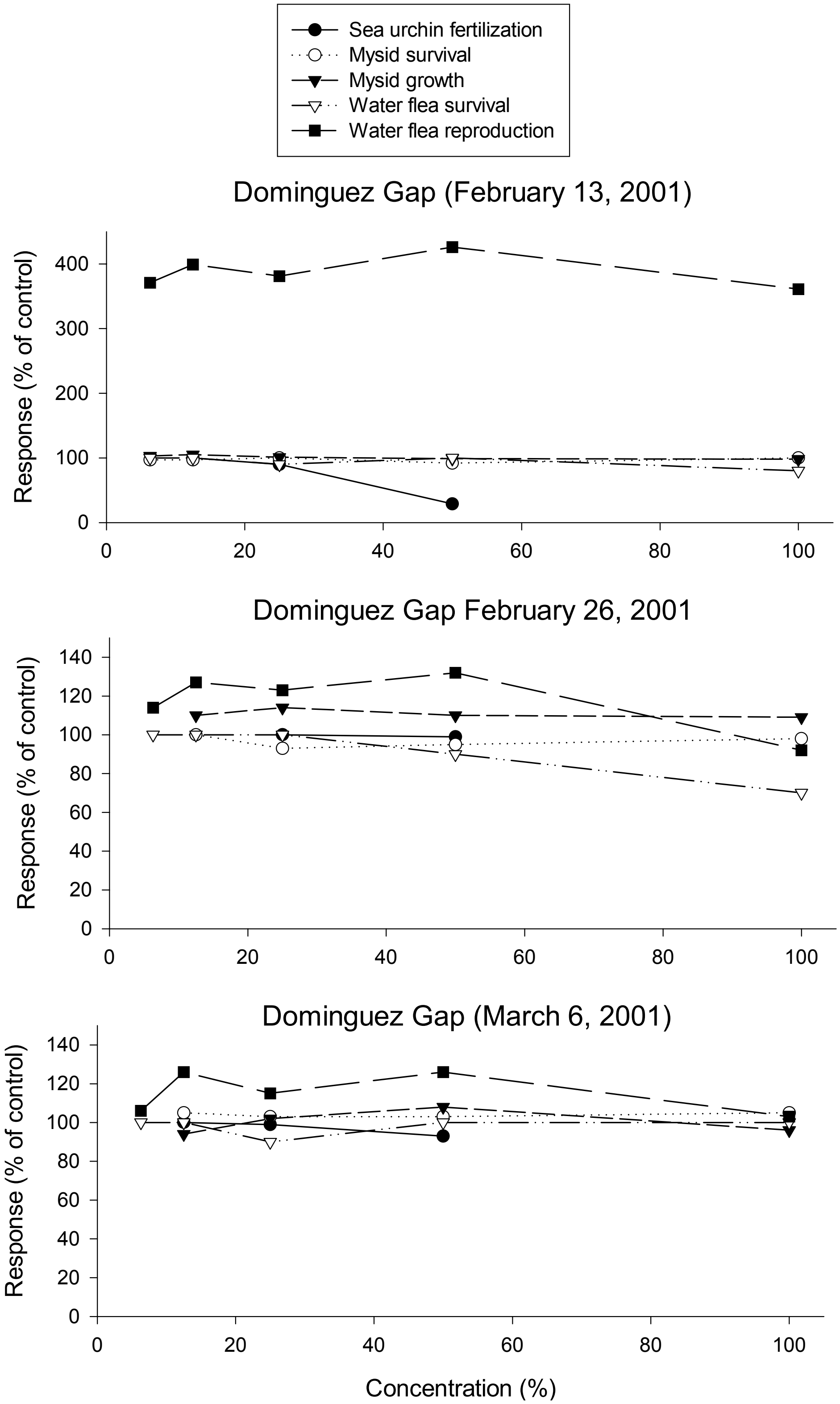


Figure 7.5.Toxicity Dose Response Plots for Storm Water Samples Collected from the Dominguez Gap Pump Station.

Table 7.5. Toxicity of Receiving Water Samples Collected from Alamitos Bay During the 2000-2001 Storm Season.
Water flea tests were not conducted on these samples.

Date	Test	Estimated % Runoff	Test Response	Tuc[a]
1/27/2001	Mysid Survival	6	Nontoxic	<1
1/27/2001	Mysid Growth	6	Nontoxic	<1
1/27/2001	Sea Urchin	6	Nontoxic	<2
2/10/2001	Mysid Survival	12	Nontoxic	<1
2/10/2001	Mysid Growth	12	Nontoxic	<1
2/10/2001	Sea Urchin	12	Nontoxic	<2
2/23/2001	Mysid Survival	6	Nontoxic	<1
2/23/2001	Mysid Growth	6	Toxic	>1
2/23/2001	Sea Urchin	6	Nontoxic	<2
4/7/2001	Mysid Survival	4	Nontoxic	<1
4/7/2001	Mysid Growth	4	Nontoxic	<1
4/7/2001	Sea Urchin	4	Nontoxic	<2

[a] Chronic toxicity units = 100/NOEC.

7.2 Toxicity Identification Evaluations (TIEs)

The trigger to performing a TIE for this study was the presence of substantial toxicity for three consecutive samples at a given site. For the mysid test, toxicity was not observed for three consecutive samples at any of the sites. For the water flea test, substantial toxicity was defined as greater than 50% mortality by the 96 hr time point of the exposure. This criterion was not met for any site. Significant toxicity to urchin fertilization was observed in the first three samples for the Los Cerritos Channel station, so a TIE was successfully performed on the third sample (23 February). For the Belmont pump station, sea urchin toxicity was noted for the first two samples, so a TIE was performed on the third sample (25 February) concurrently with the initial testing of the sample, in anticipation of it being toxic. However, no toxic response to sea urchin fertilization was observed for this sample. A TIE was successfully performed concurrently with initial testing on the fourth sample (7 April) for both Los Cerritos Channel and Belmont pump.

Since the TIE on the third Los Cerritos sample was performed a few days after the initial testing, a series of dilutions of unmanipulated sample were tested (baseline toxicity) to determine if any changes in toxicity had occurred during storage. It was found that the toxicity of this sample was greatly reduced from the initial testing (Figure 7.6). This reduction indicates that the initial toxicity may have been partially caused by a volatile component lost to the air or by constituents adsorbing to the surface of the storage container. The TIE treatments that were highly effective at removing toxicity were addition of EDTA and sample centrifugation. The effectiveness of the EDTA indicates that cationic metals were the cause of toxicity. The removal of toxicity by centrifugation indicates that either the particles themselves or a contaminant associated with them was interfering with the sea urchin fertilization. Addition of sodium thiosulfate may have had a small effect, but the effect was small enough as to be difficult to separate from test variability. The effectiveness of the C-18 extraction is indeterminate since the sample applied to the column had already been centrifuged and thus the toxicity removed.

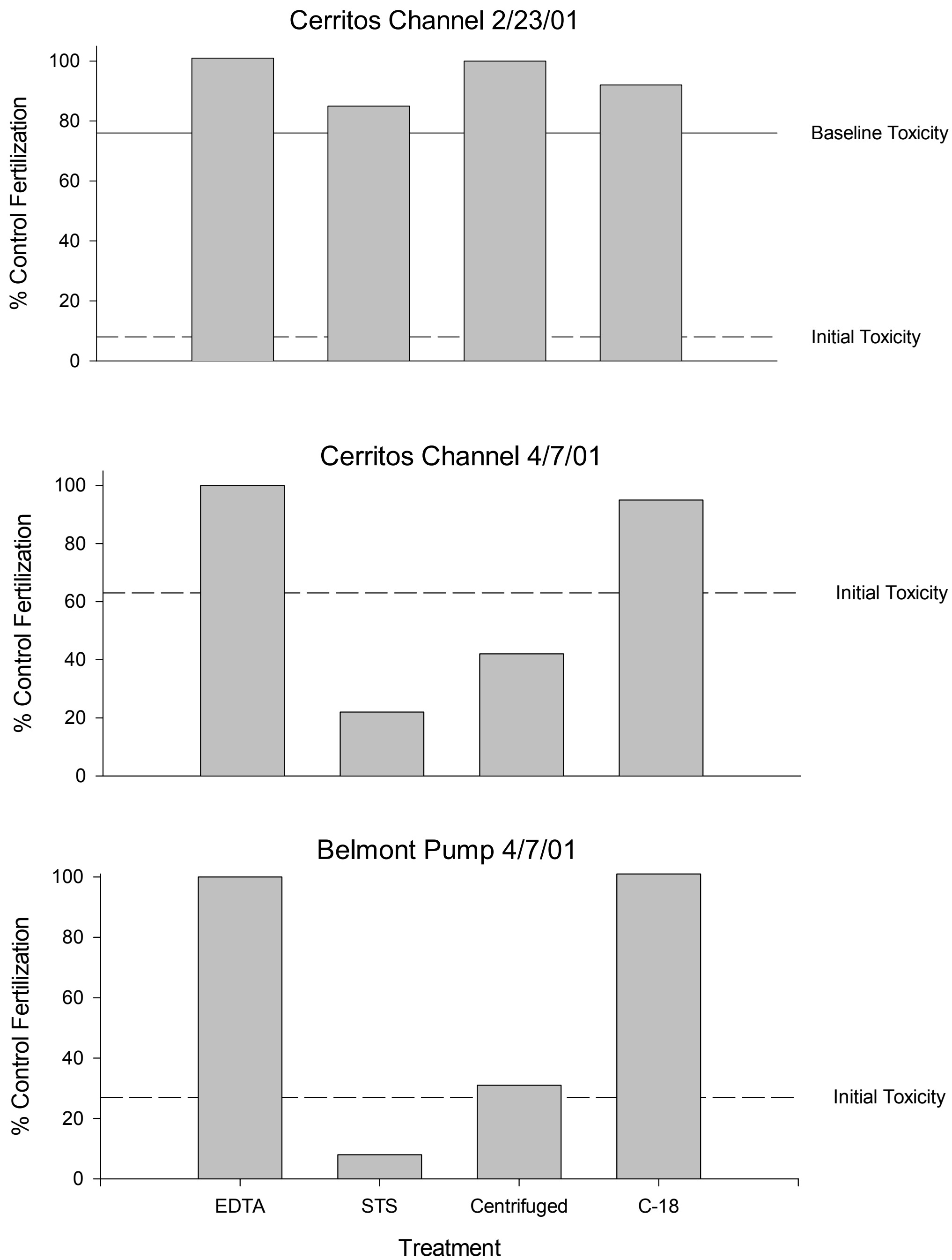


Figure 7.6. Summary of Phase I TIE Analyses on Storm Water Samples from the Los Cerritos Channel and the Belmont Pump Station.

The results of the TIEs on the fourth Los Cerritos and Belmont samples were very similar (Figure 7.6). EDTA was again very effective at reducing toxicity in both samples, as was C-18 column extraction. Again, the effectiveness of EDTA implicates cationic metals. Solid phase extraction with the C-18 column removes non-polar organics from the sample. However, it has also been found that these columns can remove cationic metals. Unlike the previous Los Cerritos sample, centrifugation did not remove toxicity from this Los Cerritos sample and the small effect of centrifugation on the Belmont sample cannot be separated from normal test variability.

7.3 Dry Weather Samples

Toxicity tests were conducted on sub-samples of the composite or grab samples collected for chemical analysis. All samples were collected under dry weather conditions. The toxicity tests were initiated within 48 hours of collection. The sea urchin toxicity tests results run on June 6, 2001 dry weather samples were qualified due to some random outlier values obtained with the replicate vials, and the tests were repeated after an extended hold time. These qualifications are discussed in the QA/QC summary of Appendix A.

Dry weather sampling events were summarized in Table 6.2 above. Two such sampling events were done for the mass emission stations in the Spring of 2000, and one of two events has been sampled for the 2001 dry summer season. Another dry weather sampling event is to be carried out later in August 2001 and results will be reported as an addendum to this report. The Alamitos Bay receiving water site was sampled for these same dry weather events, with the addition of an early Spring 2000 event (April 10, 2000) that was included just prior to the activation of a low-flow diversion for the discharge from the pump station for Drainage Basin 24.

7.3.1 Dry Weather Toxicity Results for Mass Emission Stations

7.3.1.1 Belmont Pump Station

Three 24 hour composite samples from the Belmont pump station have been tested with three species, the water flea (freshwater crustacean), mysid (marine crustacean), and sea urchin (marine). The first sample (collected June 22, 2000) did not produce toxicity to any of the species (Table 7.6). A statistically significant reduction in sea urchin fertilization was produced by this sample, but the effect was extremely small (4 % reduction in fertilization), as shown in the dose response plot for this sample. The slight effect on fertilization produced by this is an artifact resulting from the extremely low variability this particular test and is not considered to be a reproducible result.

The second Belmont sample (collected June 29, 2000) produced toxic responses in all three test species. Water flea survival was the most sensitive indicator of survival, exposure to 17 % sample was calculated to produce a 50 % reduction in *Ceriodaphnia* survival (Table 7.6). Effects on water flea reproduction occurred at similar concentrations to survival effects (Figure 7.6). Toxic effects on the two marine species were also produced by the June 29, 2000 Belmont sample, with significant reductions in mysid survival and sea urchin fertilization produced by the 100 % and 50 % sample concentrations, respectively. A trend of reduced mysid growth was also observed among the highest concentrations of the Belmont sample, but this response appeared to be due to the salinity adjustment procedure as the sea salt control also showed reduced growth relative to the natural seawater control. No significant differences in mysid growth were present when the data were compared to the sea salt control.

The third Belmont sample (collected June 5, 2001) did not produce toxic responses in any of the three test species (Table 7.6).

Table 7.6 Toxicity of Dry Weather Samples from Mass Emission Sites Collected from the City of Long Beach during the 1999/2001 Monitoring Seasons. Test results indicating toxicity are shown in bold type.

			Test Response (% sample)			
Station	Date	Test	NOEC[a]	LOEC[b]	Median Response[c]	TUc[d]
Belmont	6/21/2000	Water Flea Survival	≥100	>100	>100	≤1
Belmont	6/21/2000	Water Flea Reproduction	≥100	>100	>100	≤1
Belmont	6/21/2000	Mysid Survival	≥100	>100	>100	≤1
Belmont	6/21/2000	Mysid Growth	≥100	>100	>100	≤1
Belmont	6/21/2000	Sea Urchin Fertilization	25[e]	50[e]	>50	4[e]
Belmont	**6/29/2000**	**Water Flea Survival**	**12**	**25**	**16.9**	**8**
Belmont	**6/29/2000**	**Water Flea Reproduction**	**12**	**25**	**18.7**	**8**
Belmont	**6/29/2000**	**Mysid Survival**	**50**	**100**	**65.0**	**2**
Belmont	6/29/2000	Mysid Growth	≥100	>100	>100	≤1
Belmont	**6/29/2000**	**Sea Urchin Fertilization**	**25**	**50**	**>50**	**4**
Belmont	6/6/2001	Water Flea Survival	100	>100	>100	<1
Belmont	6/6/2001	Water Flea Reproduction	100	>100	>100	<1
Belmont	6/6/2001	Mysid Sruvival	100	>100	>100	<1
Belmont	6/6/2001	Mysid Growth	100	>100	>100	<1
Belmont	6/7/2001	Sea Urchin Fertilization	50	>50	>50	<2
Belmont	6/29/2001	Sea Urchin Fertilization (Rerun)	50	>50	>50	<2
Bouton Crk.	6/21/2000	Water Flea Survival	≥100	>100	>100	≤1
Bouton Crk.	6/21/2000	Water Flea Reproduction	≥100	>100	>100	≤1
Bouton Crk.	6/21/2000	Mysid Survival	≥100	>100	>100	≤1
Bouton Crk.	6/21/2000	Mysid Growth	≥100	>100	>100	≤1
Bouton Crk.	6/21/2000	Sea Urchin Fertilization	≥50	>50	>50	≤2
Bouton Crk.	6/29/2000	Water Flea Survival	≥100	>100	>100	≤1
Bouton Crk.	**6/29/2000**	**Water Flea Reproduction**	**50**	**100**	**>100**	**2**
Bouton Crk.	6/29/2000	Mysid Survival	≥100	>100	>100	≤1
Bouton Crk.	6/29/2000	Mysid Growth	≥100	>100	>100	≤1
Bouton Crk.	**6/29/2000**	**Sea Urchin Fertilization**	**12**	**25**	**39.8**	**8**
Bouton Crk.	**6/6/2001**	**Water Flea Survival**	**25**	**50**	**33**	**4**
Bouton Crk.	**6/6/2001**	**Water Flea Reproduction**	**12.5**	**25**	**24.1**	**8**
Bouton Crk.	6/6/2001	Mysid Survival	100	>100	>100	<1
Bouton Crk.	6/6/2001	Mysid Growth	100	>100	>100	<1
Bouton Crk.	**6/7/2001**	**Sea Urchin Fertilization**	**50**	**>50**	**>50**	**<2**
Bouton Crk.	**6/29/2001**	**Sea Urchin Fertilization (Rerun)**	**50**	**>50**	**>50**	**<2**
Cerritos Ch.	6/6/2001	Water Flea Survival	50	100	70.7	2
Cerritos Ch.	6/6/2001	Water Flea Reproduction	50	100	78.4	2
Cerritos Ch.	6/6/2001	Mysid Survival	100	>100	>100	<1
Cerritos Ch.	6/6/2001	Mysid Growth	100	>100	>100	<1
Cerritos Ch.	**6/7/2001**	**Sea Urchin Fertilization**	**3.1**	**6.25**	**36.2**	**32**
Cerritos Ch.	**6/29/2001**	**Sea Urchin Fertilization (Rerun)**	**6.25**	**12.5**	**>50**	**16**

[a] No Observed Effect Concentration: the highest concentration with a test response not significantly different from the control.

[b] Lowest Observed Effect concentration: the lowest concentration producing a test response that was significantly different from the control.

[c] Concentration causing 50% mortality to mysids or water fleas (LC50), 50% inhibition in water flea reproduction (IC50), or 50% reduction in sea urchin fertilization or mysid growth (EC50).

[d] Chronic toxicity units = 100/NOEC.

[e] Minimal amount of toxicity present (94 % fertilization in highest test concentration); detection of statistically significant reduction in fertilization due to extremely low variability of results.

7.3.1.2 Bouton Creek

Three time averaged composite samples taken during periods of low tide were also collected from Bouton Creek, and were tested with the same three species.

No toxicity was detected in the first composite sample collected on June 21, 2000 from Bouton Creek (Table 7.6). All of the test endpoints were similar to the control responses. Both the water flea and sea urchin tests detected toxicity in the second Bouton Creek sample, collected on June 29, 2000. Sea urchin fertilization was the most sensitive indicator of toxicity in this sample as determined by dose response plots. Mysid survival or growth was not affected by this sample, although small reductions in growth were apparently caused by the addition of sea salts for salinity adjustment.

The third Bouton Creek sample, collected June 5, 2001 produced no detectable toxicity to the two marine species, but the freshwater *Cereodaphnia* test showed significantly reduced survival at the 100%, 50%, and 25% sample concentrations and reduced reproduction at the 100%, 50%, and 25% concentrations. The conductivity of the sample was high (about 14,000 umho/cm, and a concurrent conductivity control test showed identical results to those obtained with undiluted Bouton Creek sample. These data suggest that the toxicity of *Cereodaphnia* can be attributed to osmotic effects rather than to contaminants.

7.3.1.3 Cerritos Channel

A 24-hour dry weather composite sample from the third mass emission site at Cerritos Channel was sampled for the first time on 5 June 2001 and was tested with the same three species. The water flea test detected both reduced survival and reduced reproduction, in the 100% concentration of the Cerritos sample. The mysid test showed no decrease in survival or growth at any sample concentration. The sea urchin tests showed very significantly reduced fertilization at low sample concentrations, though the data are qualified and must be viewed with caution. Both the initial urchin toxicity run and the repeat test carried out after an extensive holding time showed this significantly reduced fertilization.

7.3.2 Dry Weather Toxicity Results for Alamitos Bay Receiving Water

Four samples of Alamitos Bay receiving water were tested for toxicity to mysids and sea urchins. None of the samples produced toxicity to either species (Table 7.7). In all cases, the performance of the test species when exposed to an undiluted water sample was similar to the control sample, which consisted of filtered natural seawater collected from offshore of Redondo Beach, or from the seawater system at Long Marine Laboratory, UC Santa Cruz.

Table 7.7. Toxicity of Receiving Water Samples Collected from Alamitos Bay During the 1999/2001 Dry Weather Monitoring Seasons. (Water flea tests were not conducted on these samples.)

		Test Response (% sample)		
Date	Test	NOEC[a]	LOEC[b]	TUc[c]
4/10/2000	Mysid Survival	≥100	>100	<1
4/10/2000	Mysid Growth	≥100	>100	<1
4/10/2000	Sea Urchin	≥50	>50	<2
6/21/2000	Mysid Survival	≥100	>100	<1
6/21/2000	Mysid Growth	≥100	>100	<1
6/21/2000	Sea Urchin	≥50	>50	<2
6/29/2000	Mysid Survival	≥100	>100	<1
6/29/2000	Mysid Growth	≥100	>100	<1
6/29/2000	Sea Urchin	≥50	>50	<2
6/6/2001	Mysid Survival	100	>100	<1
6/6/2001	Mysid Growth	100	>100	<1
6/6/2001	Sea Urchin	50	>50	<2
6/29/2001	Sea Urchin	50	>50	<2

[a] No Observed Effect Concentration: the highest concentration with a test response not significantly different from the control.
[b] Lowest Observed Effect concentration: the lowest concentration producing a test response that was significantly different from the control.
[c] Chronic toxicity units = 100/NOEC.

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8.0 DISCUSSION

8.1 Wet Season Water Quality

Storm water quality data from the four mass emission sites in Long Beach were grouped to provide an initial characterization of discharges from the City (Table 8.1). Due to the limited data set available at this time, descriptive statistics were based upon detected values and the assumption that all data are log normally distributed. Most storm water investigations conducted since the initial Nationwide Urban Runoff Program (NURP) (EPA 1983) studies have found that the majority of constituents in storm water tend to be log normally distributed. As the City of Long Beach database expands, the distribution of these data will be tested to determine if transformations are necessary for statistical comparisons and methods will be applied to incorporate censored (below detection limit) data where appropriate.

A preliminary comparison of combined data from all Long Beach mass emission sites with similar data from Los Angeles County and available guidelines and standards provides some indication of possible trends (Table 8.1). In general, mean EMCs for most storm water contaminants were comparable to values reported for Los Angeles County. Data from Los Angeles County generally have higher Coefficients of Variation (CVs) that are likely due to higher between site variations.

Various receiving water quality criteria provide valuable reference points for assessing the importance of various storm water contaminants. Exceedances of receiving water quality standards, however, do not necessarily indicate impairment. Other factors such as dilution and transformation in the receiving waters, beneficial uses, and habitat types must also be considered. Currently, numerical standards are not available for storm water discharges.

The mean EMCs for three of the total metals in storm water discharges from the City of Long Beach exceeded 1997 Ocean Plan Daily Maximum criteria. The greatest exceedance was for total lead that was roughly five times the Ocean Plan daily maximum. The mean EMC for total copper was three times the Ocean Plan criteria and the mean EMC for total zinc was approximately four times the Ocean Plan Daily Maximum.

A comparison of mean EMCs for dissolved metals from the City of Long Beach with California Toxics Rule (CTR) criteria indicated that mean EMCs for two metals exceeded these reference values. Mean dissolved copper from Long Beach sites was 12 µg/L, which exceeds CTR freshwater acute and chronic criteria as well as saltwater chronic criteria. The mean EMC for dissolved zinc exceeds both freshwater criteria but is approximately 75% of the CTR saltwater criteria.

Concentrations of bacteria were based upon grab samples taken once during each event. The mean concentrations of bacteria for all sites and events were 143,116 mpn/100 ml for total coliform, 45,367 mpn/100 ml for fecal coliform, and 14,716 mpn/100 ml for fecal streptococcus. Concentrations of this magnitude are common in urban runoff. Although bacterial concentrations can vary substantially between events and sites, these initial measurements are approximately an order of magnitude lower than similar measurements from the County. Although the differences in concentration of bacterial contaminants are large, it is possible that they are an artifact of the limited temporal and spatial sampling conducted to date.

A brief comparison of storm water quality among the four mass emission sites monitored during the 2000-2001 season suggests some general trends among sites (Table 8.2). Runoff collected from open channels in Bouton Creek and Los Cerritos Channel both had the highest levels of suspended solids. Storm water discharges from the Dominguez Gap site tend to have lower levels of total suspended solids as well as total copper, lead and zinc. Total aluminum and iron in storm water discharges from the Dominguez Gap site are the second highest among the four sites. Both aluminum and iron are present at high concentrations in soils and are often used to normalize data to evaluate relative enhancement of other metals relative to background soil. Preliminary data from the Dominguez Gap discharges would suggest that copper, lead, and zinc may be less enhanced in discharges from this site.

Discharges from the Belmont Pump station had the highest levels of total and dissolved copper during the past season with mean EMC of 62 and 20 µg/L (Table 8.2). The highest concentrations of both total and dissolved copper were encountered at this station during the 23 February and 7 April events (Table 6.1). Concentrations of dissolved copper were 1.5 to 2 times the CTR's Criterion Maximum Concentration (CMC) for saltwater.

With the exception of total copper, total recoverable trace metals were typically highest in discharges collected from Los Cerritos Channel where total suspended solids were consistently among the highest levels measured during the past year (170-350 mg/L).

Dissolved zinc was notably higher in discharges from the Belmont Pump station. The mean EMC of 157 µg/L was nearly twice as high as in runoff from Bouton Creek and Los Cerritos Channel. This, however, was largely driven by one value of 220 µg/L in association with the April 7th event. Relatively high values of dissolved zinc were also encountered at both Bouton Creek and Los Cerritos Channel sites during late season events. An EMC of 140 µg/L was measured in water from Bouton Creek during the April 7th event. An EMC of 150 µg/L of dissolved zinc was reported in water from Los Cerritos Channel during the April 21st event. In each of these case the EMC exceeded CTR CMCs for saltwater of 120 µg/L.

With the exception of bis(2-ethylhexyl)phthalate, organic compounds were rarely detected in the storm water samples. Occurrences of organic compounds were limited to one occurrence of the preemergent herbicide, diuron; three occurrences of both alpha and beta BHC; three organophosphate pesticides (diazinon, malathion, and simazine); and six herbicides (dicamba, MCPP, MCPA, 2,4-D, 2,4,DB, and glyphosate). Glyphosate was detected during the 7 April event in water from Los Cerritos channel at moderately high levels (94 µg/L). The trade name for Glyphosate is Round-Up. This chemical is commonly used around roadways to control weed growth. The occurrence of this chemical in the storm water suggests a recent application in the watershed.

Table 8.1 Storm Water Monitoring Chemistry Guidelines and Mass Emission Sites Results. (Page 1 of 5)

		GUIDELINES AND STANDARDS						MASS EMISSION SITES									
		1997 Ocean Plan		CTR (saltwater)		CTR (freshwater)		County of Los Angeles					City of Long Beach (2000-2001)				
										Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Achieved Reporting Limit	6-Month Median	Daily Max	CMC	CCC	CMC	CCC	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
CONVENTIONALS																	
Oil and Grease (mg/L)	5.0	NA	NA	NA	NA	NA	NA	160	48	2.2	0.5	2.04	15	7	ID	ID	ID
Total Phenols (mg/L)	0.1	NA	NA	NA	NA	NA	NA	160	2	ID	ID	ID	16	0	ID	ID	ID
Cyanide (µg/L)	5.0	0.001	0.004	22.0	5.2	1.0	1.0	128	14	ID	ID	ID	16	0	ID	ID	ID
pH (units)	0.1	NA	NA	NA	NA	NA	NA	184	100	7.4	7.4	0.06	16	100	7.0	7.0	0.06
Dissolved Phosphorus (mg/L)	0.001	NA	NA	NA	NA	NA	NA	182	97	0.3	0.3	0.67	16	100	0.19	0.15	0.56
Total Phosphorus (mg/L)	0.002	NA	NA	NA	NA	NA	NA	182	99	0.5	0.4	0.70	16	100	0.53	0.45	0.43
Turbidity (NTU)	0.1	NA	NA	NA	NA	NA	NA	183	100	109	64	1.44	16	100	116	74	0.76
Total Suspended Solids (mg/L)	1.0	NA	NA	NA	NA	NA	NA	166	100	255	160	1.24	16	100	223	88	1.24
Total Dissolved Solids (mg/L)	1.0	NA	NA	NA	NA	NA	NA	164	100	362	219	0.96	16	100	186	111	0.82
Volatile Suspended Solids (mg/L)	1.0	NA	NA	NA	NA	NA	NA	183	99	51	41	0.99	16	0	ID	ID	ID
Total Organic Carbon (mg/L)	1.0	NA	NA	NA	NA	NA	NA	184	100	10	8	0.73	16	100	18	11	0.80
Total Recoverable Petroleum Hydrocarbon (mg/L)	5.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	0	ID	ID	ID
Biochemical Oxygen Demand (mg/L)	10.0	NA	NA	NA	NA	NA	NA	173	97	25	18	1.27	16	75	18	16	0.36
Chemical Oxygen Demand (mg/L)	4.0	NA	NA	NA	NA	NA	NA	159	96	74	55	0.96	16	100	120	86	0.63
Total Ammonia-Nitrogen (mg/L)	0.1	0.6	2.4	NA	NA	NA	NA	188	66	0.7	0.3	1.57	16	100	0.8	0.5	0.68
Total Kjeldahl Nitrogen (mg/L)	0.1	NA	NA	NA	NA	NA	NA	173	99	3.1	2.3	0.79	16	100	2.6	1.9	0.65
Nitrite Nitrogen (mg/L)	0.2	NA	NA	NA	NA	NA	NA	186	81	0.19	0.09	1.32	16	0	ID	ID	ID
Nitrate Nitrogen (mg/L)	0.01	NA	NA	NA	NA	NA	NA	166	97	1.5	1.2	0.90	16	100	0.82	0.51	0.78
Alkalinity, as CaCO3 (mg/L)	0.1-1.0	NA	NA	NA	NA	NA	NA	184	100	84	66	0.68	16	100	31	26	0.42
Specific Conductance (µmhos/cm)	1.0	NA	NA	NA	NA	NA	NA	164	100	362	219	0.96	16	100	293	155	0.94
Total Hardness (mg/L)	1.0	NA	NA	NA	NA	NA	NA	164	100	179	110	1.01	16	100	124	73	0.84
MBAS (mg/L)	0.02	NA	NA	NA	NA	NA	NA	153	44	0.08	0.03	1.43	16	94	0.17	0.11	0.79
Chloride (mg/L)	1.0	NA	NA	NA	NA	NA	NA	185	99	42	29	0.92	16	100	103	19	2.11
Fluoride (mg/L)	0.1	NA	NA	NA	NA	NA	NA	185	78	0.2	0.2	0.68	16	69	0.2	0.2	0.37
Sulfate (mg/L)	2.0	NA	NA	NA	NA	NA	NA	185	99	103	48	1.33	16	100	20	12	0.80
Methyl tertiary butyl ether (MTBE) (µg/L)	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	20	1.6	1.5	0.24
BACTERIA (mpn/100ml)																	
Total Coliform	2.0	1000(c)	NA	NA	NA	NA	NA	163	97	1,596,086	300,000	2.27	15	100	143,116	67,539	1.06
Fecal Coliform	2.0	200(c)	NA	NA	NA	NA	NA	163	98	962,419	50,000	3.38	15	100	45,367	13,356	1.55
Fecal Streptococcus	1.0	NA	NA	NA	NA	NA	NA	163	97	524,640	160,000	2.98	15	100	14,716	9,099	0.79
TOTAL METALS (µg/L)																	
Aluminum	50	NA	NA	NA	NA	NA	NA	175	89	2,009	325	2.99	16	100	1,614	949	0.84
Arsenic	0.5	8	32	NA	NA	NA	NA	159	8	ID	ID	ID	16	94	2.6	2.1	0.48
Beryllium	1.0	NA	NA	NA	NA	NA	NA	159	0	ID	ID	ID	16	6	ID	ID	ID
Cadmium	0.5	1	4	NA	NA	NA	NA	159	18	ID	ID	ID	16	56	1.5	1.2	0.56
Chromium	1.0	NA	NA	NA	NA	NA	NA	159	29	8.1	2.5	2.03	16	100	4.6	3.4	0.62
Copper	1.0	3	12	NA	NA	NA	NA	175	97	23.1	12	1.94	16	100	35	25	0.64
Hexavalent Chromium (mg/L)	0.02	2	8	NA	NA	NA	NA	175	0	ID	ID	ID	16	0	ID	ID	ID
Iron	25	NA	NA	NA	NA	NA	NA	193	91	4,280	670	2.60	16	100	2,217	1,293	0.85
Lead	1.0	2	8	NA	NA	NA	NA	159	36	25	2.5	4.48	16	100	38	23	0.78
Mercury	0.2	0.04	0.16	NA	NA	NA	NA	191	2	ID	ID	ID	16	19	0.34	0.29	0.39
Nickel	1.0	5	20	NA	NA	NA	NA	193	50	9.3	2.5	1.74	16	100	8.8	5.6	0.74
Zinc	5.0	20	80	NA	NA	NA	NA	193	62	127	64	1.83	16	100	349	184	0.94
DISSOLVED METALS (µg/L)																	
Aluminum	50	NA	NA	NA	NA	NA	NA	175	45	567	50	2.29	16	69	188	137	0.61
Arsenic	0.5	NA	NA	340	150	69	36	159	1	ID	ID	ID	16	94	1.2	1.2	0.25
Beryllium	1.0	NA	NA	NA	NA	NA	NA	156	0	ID	ID	ID	16	0	ID	ID	ID
Cadmium	0.5	NA	NA	4.3	2.2	42	9.3	159	11	ID	ID	ID	16	25	0.41	0.34	0.43
Chromium	1.0	NA	NA	550	180	NA	NA	159	8	ID	ID	ID	16	50	1.5	1.4	0.24
Copper	1.0	NA	NA	13	9	4.8	3.1	159	58	13	5.8	2.23	16	100	12	9.1	0.56
Iron	25	NA	NA	NA	NA	NA	NA	193	54	756	120	2.70	16	88	241	140	0.85

Table 8.1 Storm Water Monitoring Chemistry Guidelines and Mass Emission Sites Results. (Page 2 of 5)

		GUIDELINES AND STANDARDS						MASS EMISSION SITES									
		1997 Ocean Plan		CTR (saltwater)		CTR (freshwater)		County of Los Angeles					City of Long Beach (2000-2001)				
										Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Reporting Limit	6-Month Median	Daily Max	CMC	CCC	CMC	CCC	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
DISSOLVED METALS (µg/L) (continued)																	
Lead	1.0	NA	NA	65	2.5	210	8.1	159	15	ID	ID	ID	16	69	1.7	1.5	0.32
Mercury	0.2	NA	NA	NA	NA	NA	NA	191	0	ID	ID	ID	16	0	ID	ID	ID
Nickel	1.0	NA	NA	470	52	74	8.2	159	25	5.2	2.5	1.56	16	94	3.2	2.5	0.51
Zinc	5.0	NA	NA	120	120	80	81	193	25	73	25	2.43	16	100	90	56	0.78
CHLORINATED PESTICIDES (µg/L)																	
Aldrin	0.05	NA	NA	3	NA	1.3	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
alpha-BHC	0.05	0.004(b)	0.008(b)	NA	NA	NA	NA	0	NA	NA	NA	NA	16	13	0.11	0.08	0.65
beta-BHC	0.05	0.004(b)	0.008(b)	NA	NA	NA	NA	0	NA	NA	NA	NA	16	13	0.09	0.09	0.14
delta-BHC	0.05	0.004(b)	0.008(b)	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
gamma-BHC (lindane)	0.05	0.004(b)	0.008(b)	0.95	NA	0.16	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
alpha-Chlordane	0.5	NA	NA	2.4(e)	0.043(e)	0.09(e)	0.004(e)	0	NA	NA	NA	NA	16	0	ID	ID	ID
gamma-Chlordane	0.5	NA	NA	2.4(e)	0.043(e)	0.09(e)	0.004(e)	0	NA	NA	NA	NA	16	0	ID	ID	ID
4,4'-DDD	0.05	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
4,4'-DDE	0.05	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
4,4'-DDT	0.05-0.1	NA	NA	1.1	0.001	0.13	0.001	0	NA	NA	NA	NA	16	0	ID	ID	ID
Dieldrin	0.1	NA	NA	0.24	0.056	0.71	0.0019	0	NA	NA	NA	NA	16	0	ID	ID	ID
Endosulfan I	0.05	0.009(a)	0.018(a)	0.22	0.056	0.034	0.0087	0	NA	NA	NA	NA	16	0	ID	ID	ID
Endosulfan II	0.05-0.1	0.009(a)	0.018(a)	0.22	0.056	0.034	0.0087	0	NA	NA	NA	NA	16	0	ID	ID	ID
Endosulfan sulfate	0.1	0.009(a)	0.018(a)	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Endrin	0.1	0.002	0.004	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Endrin Aldehyde	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Endrin Ketone	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Heptachlor	0.05	NA	NA	0.52	0.0038	0.053	0.0036	0	NA	NA	NA	NA	16	0	ID	ID	ID
Heptachlor Epoxide	0.05	NA	NA	0.52	0.0038	0.053	0.0036	0	NA	NA	NA	NA	16	0	ID	ID	ID
Methoxychlor	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Toxaphene	1.0	NA	NA	0.73	0.0002	0.21	0.0002	0	NA	NA	NA	NA	16	0	ID	ID	ID
Total PCBs	1.0	NA	NA	NA	0.014	NA	0.03	0	NA	NA	NA	NA	16	0	ID	ID	ID
CARBAMATE & UREA PESTICIDES (µg/L)																	
Oxamyl	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Methomyl	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Fenuron	4	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Monuron	4	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Propoxur	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Carbofuran	10	NA	NA	NA	NA	NA	NA	169	0	ID	ID	ID	16	0	ID	ID	ID
Carbaryl	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Flumeturon	4	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Diuron	4	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	6	ID	6.8	ID
Propham	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Siduron	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Methiocarb	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Linuron	4	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Swep	4	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Chlorpropham	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Brabane	10	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Neburon	4	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
AROCLORS (µg/L)																	
Aroclor-1016	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Aroclor-1221	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Aroclor-1232	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Aroclor-1242	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Aroclor-1248	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID

Table 8.1 Storm Water Monitoring Chemistry Guidelines and Mass Emission Sites Results. (Page 3 of 5)

		GUIDELINES AND STANDARDS						MASS EMISSION SITES									
		1997 Ocean Plan		CTR (saltwater)		CTR (freshwater)		County of Los Angeles					City of Long Beach (2000-2001)				
										Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Reporting Limit	6-Month Median	Daily Max	CMC	CCC	CMC	CCC	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
AROCLORS (µg/L) (continued)																	
Aroclor-1254	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Aroclor-1260	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
ORGANOPHOSPHATE PESTICIDES (µg/L)																	
Azinphos methyl	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Bolstar	0.05	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Coumaphos	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Demeton O & S	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Diazinon	0.01-1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	6	ID	0.21	ID
Dicholorvoz	0.01	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Disulfoton	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Dursban (chlorpyrifos)	0.05-1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Ethoprop	0.05	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Fensulfothion	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Fenthion	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Merphos	0.05	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Malathion	0.1-1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	6	ID	0.27	ID
Mevinphos	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Parathion methyl	0.05	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Phorate	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Ronnel	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Stirophos	0.05	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Tokuthion	0.05	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Tricholronate	0.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	1	0	ID	ID	ID
Prometryn	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Atrazine	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Simazine	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	13	ID	1.1	ID
Cyanazine	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
HERBICIDES (µg/L)																	
Dalapon	2.0-3.1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	0	ID	ID	ID
Dicamba	0.22-0.50	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	7	ID	1.8	ID
MCPP	22-250	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	13	ID	69	ID
MCPA	22-250	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	7	ID	59	ID
Dichlorprop	0.22-1	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	7	ID	48	ID
2,4-D	0.22-2.0	NA	NA	NA	NA	NA	NA	86	0	ID	ID	ID	16	13	ID	1.1	ID
2,4,5-TP-Silvex	0.22-0.50	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
2,4,5-T	0.22-1.0	NA	NA	NA	NA	NA	NA	86	0	ID	ID	ID	15	0	ID	ID	ID
2,4-DB	0.22-20.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	33	1.2	0.9	0.58
Dinoseb	0.22-10.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	15	0	ID	ID	ID
Bentazon	1.0-20.0	NA	NA	NA	NA	NA	NA	86	0	ID	ID	ID	16	0	ID	ID	ID
Glyphosate	5-10.0	NA	NA	NA	NA	NA	NA	111	4	ID	ID	ID	16	38	36.5	16	1.14
SEMIVOLATILES (µg/L)																	
Acenaphthene	0.5	NA	NA	NA	NA	NA	NA	10	10	ID	ID	ID	16	0	ID	ID	ID
Acenaphthylene	0.5	NA	NA	NA	NA	NA	NA	10	10	ID	ID	ID	16	0	ID	ID	ID
Acetophenone	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Aniline	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Anthracene	0.5	NA	NA	NA	NA	NA	NA	10	0	ID	ID	ID	16	0	ID	ID	ID
4-Aminobiphenyl	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Benzidine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Benzo(a)anthracene	1.0	NA	NA	NA	NA	NA	NA	10	0	ID	ID	ID	16	0	ID	ID	ID
Benzo(b)fluoranthene	1.0	NA	NA	NA	NA	NA	NA	10	10	ID	ID	ID	16	0	ID	ID	ID

Table 8.1 Storm Water Monitoring Chemistry Guidelines and Mass Emission Sites Results. (Page 4 of 5)

		GUIDELINES AND STANDARDS						MASS EMISSION SITES									
		1997 Ocean Plan		CTR (saltwater)		CTR (freshwater)		County of Los Angeles					City of Long Beach (2000-2001)				
										Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Reporting Limit	6-Month Median	Daily Max	CMC	CCC	CMC	CCC	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
SEMIVOLATILES (µg/L) (continued)																	
Benzo(k)fluoranthene	1.0	NA	NA	NA	NA	NA	NA	10	0	ID	ID	ID	16	0	ID	ID	ID
Benzo(a)pyrene	1.0	NA	NA	NA	NA	NA	NA	10	0	ID	ID	ID	16	0	ID	ID	ID
Benzyl butyl phthalate	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Bis(2-chloroethyl)ether	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Bis(2-chloroethoxy)methane	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Bis(2-ethylhexyl)phthalate	3.0	NA	NA	NA	NA	NA	NA	10	50	4	0.9	1.45	16	94	0.0	13.3	0.84
Bis(2-chlorisopropyl)ether	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
4-Bromophenyl phenyl ether	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
4-Chloroaniline	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
1-Chloronaphthalene	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
2-Chloronaphthalene	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
4-Chlorophenyl phenyl ether	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Chrysene	1.0	NA	NA	NA	NA	NA	NA	10	10	ID	ID	ID	16	0	ID	ID	ID
p-Dimethylaminoazobenzene	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
7,12-Dimethylbenz(a)-anthracene	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
a-,a-Dimethylphenethylamine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Dibenz(a,j)acridine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Dibenz(a,h)anthracene	1.0	NA	NA	NA	NA	NA	NA	10	0	ID	ID	ID	16	0	ID	ID	ID
1,3-Dichlorobenzene	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
1,2-Dichlorobenzene	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
1,4-Dichlorobenzene	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
3,3-Dichlorobenzidine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Diethyl phthalate	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Dimethyl phthalate	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Di-n-butylphthalate	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
2,4-Dinitrotoluene	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
2,6-Dinitrotoluene	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Diphenylamine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
1,2-Diphenylhydrazine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Di-n-octylphthalate	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Ethyl methanesulfonate	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Endrin ketone	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Fluoranthene	1.0	NA	NA	NA	NA	NA	NA	10	30	0.07	0.05	0.49	16	0	ID	ID	ID
Fluorene	1.0	NA	NA	NA	NA	NA	NA	10	0	ID	ID	ID	16	0	ID	ID	ID
Hexachlorobenzene	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Hexachlorobutadiene	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Hexachlorocyclopentadiene	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Hexachloroethane	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Indeno[1,2,3-cd]pyrene	1.0	NA	NA	NA	NA	NA	NA	10	0	ID	ID	ID	16	0	ID	ID	ID
Isophorone	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
3-Methylcholanthrene	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Methyl methanesulfonate	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Naphthalene	0.5	NA	NA	NA	NA	NA	NA	10	10	ID	ID	ID	16	0	ID	ID	ID
1-Naphthylamine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
2-Naphthylamine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
2-Nitroaniline	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
3-Nitroaniline	3.0	Na	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID

Table 8.1 Storm Water Monitoring Chemistry Guidelines and Mass Emission Sites Results. (Page 5 of 5)

		GUIDELINES AND STANDARDS						MASS EMISSION SITES									
		1997 Ocean Plan		CTR (saltwater)		CTR (freshwater)		County of Los Angeles					City of Long Beach (2000-2001)				
										Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Reporting Limit	6-Month Median	Daily Max	CMC	CCC	CMC	CCC	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
SEMIVOLATILES (µg/L) (continued)																	
4-Nitroaniline	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Nitrobenzene	0.5	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
N-Nitrosodimethylamine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
N-Nitrosodiphenylamine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
N-Nitroso-di-n-propylamine	1.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
N-Nitrosopiperidine	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Pentachlorobenzene	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Phenacitin	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Phenanthrene	0.5	NA	NA	NA	NA	NA	NA	10	20	0.039	0.025	0.93	16	0	ID	ID	ID
2-Picoline	3.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Pronamide	5.0	NA	NA	NA	NA	NA	NA	0	NA	NA	NA	NA	16	0	ID	ID	ID
Pyrene	0.5	NA	NA	NA	NA	NA	NA	10	40	0.126	0.025	1.64	16	0	ID	ID	ID

CTR = California Toxics Rule - Water Quality Standards; Establishment of Numeric Criteria for Priority Pollutants for the State of California; Rule, Federal Register 40 CFR Part 131.
CMC = Criterion Maximum Concentration.
CCC = Criterion Continuous Concentration.
ID = Insufficient data.
NA = Information not available
a. Endosulfan criteria are the sum of endosulfan I, endosulfan II and endosulfan sulfate.
b. Objectives apply to the summation of alpha, beta, delta, and gamma hexachlorocyclohexane termed HCH in the California Ocean Plan.
c. Criteria based upon 30-day average.
d. Dichlorobenzenes evaluated as sum of 1,2 and 1,3 dichorobenzenes.
e. Chlordanes evaluated as sum of 7 compounds.
f. DDT evaluated as sum of DDT, DDD, and DDE isomers.
g. Heptachlor evaluated as sum of heptachlor and heptachlor epoxide.
h. PCBs evaluated as sum of arochlors.

Table 8.2 Storm Water Monitoring Chemistry Statistics for Each Watershed. (Page 1 of 5)

		Belmont Pump					Bouton Creek					Los Cerritos Channel					Dominguez Gap				
				Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Achieved Reporting Limit	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
CONVENTIONALS																					
Oil and Grease (mg/L)	5.0	3	0	ID	ID	ID	4	0	ID	ID	ID	5	20	ID	ID	ID	3	0	ID	ID	ID
Total Phenols (mg/L)	0.1	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Cyanide (µg/L)	5.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
pH (units)	NA	4	100	7.2	7.1	0.06	4	100	6.8	6.8	0.09	5	100	7.1	7.1	0.02	3	100	6.9	6.9	0.06
Dissolved Phosphorus (mg/L)	0.001	4	100	0.21	0.20	0.16	4	100	0.10	0.08	0.48	5	100	0.1	0.1	0.32	3	100	0.28	0.25	0.35
Total Phosphorus (mg/L)	0.002	4	100	0.45	0.43	0.21	4	100	0.34	0.30	0.39	5	100	0.7	0.7	0.24	3	100	0.44	0.40	0.29
Turbidity (NTU)	0.1	4	100	56	40	0.64	4	100	76	59	0.55	5	100	178	151	0.43	3	100	69	69	0.08
Total Suspended Solids (mg/L)	1.0	4	100	89	57	0.74	4	100	297	65	1.89	5	100	261	243	0.27	3	100	44	44	0.12
Total Dissolved Solids (mg/L)	1.0	4	100	247	174	0.65	4	100	319	172	0.92	5	100	108	91	0.43	3	100	50	47	0.28
Volatile Suspended Solids (mg/L)	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Total Organic Carbon (mg/L)	1.0	4	100	20	9.4	1.04	4	100	23	14	0.80	5	100	21	16	0.53	3	100	5.6	5.4	0.22
Total Recoverable Petroleum Hydrocarbon (mg/L)	5.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Biochemical Oxygen Demand (mg/L)	10.0	4	50	20	19	0.18	4	100	15	13	0.39	5	100	17	15	0.38	3	33	ID	ID	ID
Chemical Oxygen Demand (mg/L)	4.0	4	100	102	76	0.59	4	100	111	86	0.53	5	100	155	137	0.36	3	100	63	47	0.58
Total Ammonia-Nitrogen (mg/L)	0.1	4	100	0.8	0.6	0.63	4	100	0.9	0.6	0.66	5	100	0.8	0.7	0.38	3	100	0.25	0.22	0.33
Total Kjeldahl Nitrogen (mg/L)	0.1	4	100	2.6	1.8	0.64	4	100	2.3	1.8	0.52	5	100	3.6	3.0	0.43	3	100	0.91	0.90	0.12
Nitrite Nitrogen (mg/L)	0.2	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Nitrate Nitrogen (mg/L)	0.01	4	100	1.2	0.57	1.04	4	100	0.8	0.6	0.60	5	100	1.0	0.7	0.58	3	100	0.24	0.23	0.26
Alkalinity, as CaCO3 (mg/L)	0.1-1	4	100	52	43	0.46	4	100	24	23	0.25	5	100	24	22	0.25	3	100	21	20	0.12
Specific Conductance (µmhos/cm)	1.0	4	100	391	285	0.61	4	100	512	284	0.90	5	100	115	98	0.41	3	100	67	66	0.14
Total Hardness (mg/L)	1.0	4	100	143	124	0.40	4	100	167	77	1.09	5	100	88	54	0.80	3	100	118	58	1.02
MBAS (mg/L)	0.02	4	100	0.15	0.10	0.68	4	100	0.3	0.2	0.68	5	100	0.14	0.08	0.83	3	67	0.16	0.15	0.26
Chloride (mg/L)	1.0	4	100	85	51	0.82	4	100	133	66	1.01	5	100	10	7.7	0.53	3	100	4.3	4.3	0.06
Fluoride (mg/L)	0.10	4	100	0.20	0.18	0.37	4	75	0.3	0.3	0.28	5	60	0.38	0.38	0.00	3	33	ID	ID	ID
Sulfate (mg/L)	2.0	4	100	29	22.0	0.58	4	100	28	17	0.82	5	100	11	9.1	0.40	3	100	5.3	5.2	0.11
Methyl tertiary butyl ether (MTBE) (µg/L)	1.0	3	0	ID	ID	ID	4	50	1.2	1.1	0.11	5	20	ID	ID	ID	3	0	ID	ID	ID
BACTERIA (MPN/100ml)																					
Total Coliform	2..0	3	100	253,126	77,060	1.51	4	100	64,167	34,737	0.92	5	100	189,576	120,347	0.76	3	100	84,186	54,848	0.73
Fecal Coliform	2.0	3	100	1,938,703	19,704	9.87	4	100	12,869	7,980	0.78	5	100	45,411	17,582	1.26	3	100	16,497	11,375	0.67
Fecal Streptococcus	1.0	3	100	15,407	13,774	0.34	4	100	11,392	6,732	0.83	5	100	13,875	7,007	0.99	3	100	17,309	13,882	0.50
TOTAL METALS (µg/L)																					
Aluminum	25-50	4	100	799	593	0.59	4	100	996	654	0.72	5	100	2630	1709	0.73	3	100	1681	1094	0.73
Arsenic	0.5	4	100	1.8	1.7	0.21	4	100	2.3	1.8	0.55	5	80	3.1	2.9	0.21	3	100	2.1	2.0	0.21
Beryllium	1	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	33	ID	ID	ID
Cadmium	0.2-0.5	4	50	0.9	0.9	0.10	4	50	0.8	0.8	0.02	5	100	2.1	1.6	0.55	3	0	ID	ID	ID
Chromium	1	4	100	3.8	3.0	0.52	4	100	3.6	2.9	0.51	5	100	6.8	5.9	0.39	3	100	2.0	1.9	0.22
Copper	1.0-10	4	100	62	40	0.74	4	100	23	20	0.43	5	100	33	32	0.18	3	100	14	12	0.41
Hexavalent Chromium (mg/L)	0.02	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Iron	25-50-100	4	100	1113	791	0.64	4	100	1005	886	0.37	5	100	4622	2596	0.88	3	100	1588	1289	0.48
Lead	1	4	100	35	25	0.60	4	100	32	17	0.95	5	100	46	44	0.24	3	100	11	11	0.00
Mercury	0.2	4	0	ID	ID	ID	4	50	0.66	0.59	0.36	5	20	ID	ID	ID	3	0	ID	ID	ID
Nickel	1	4	100	12	6.0	1.00	4	100	5.3	4.5	0.41	5	100	11	10	0.28	3	100	2.7	2.6	0.20
Zinc	5.0-50	4	100	297	209	0.65	4	100	189	144	0.56	5	100	519	385	0.59	3	100	67	64	0.22
DISSOLVED METALS (µg/L)																					
Aluminum	25-50	4	50	205	118	0.86	4	50	165	107	0.74	5	80	83	51	0.79	3	100	208	182	0.38
Arsenic	0.5	4	100	1.1	1.0	0.24	4	100	1.1	1.0	0.18	5	80	1.2	1.2	0.17	3	100	1.6	1.4	0.40
Beryllium	1	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Cadmium	0.2-0.5	4	25	ID	ID	ID	4	25	ID	ID	ID	5	40	1.0	0.6	0.77	3	0	ID	ID	ID
Chromium	1	4	75	1.5	1.3	0.32	4	25	ID	ID	ID	5	80	1.4	1.3	0.17	3	0	ID	ID	ID
Copper	1.0-10	4	100	20	12	0.78	4	100	10	9.0	0.38	5	100	12	9.1	0.56	3	100	7.0	6.0	0.40
Iron	25-50-100	4	75	153	106	0.66	4	100	263	121	1.09	5	80	186	75	1.21	3	100	126	122	0.18
Lead	1	4	75	1.7	1.6	0.25	4	100	2.1	1.8	0.43	5	60	1.1	1.1	0.14	3	33	ID	ID	ID

Table 8.2 Storm Water Monitoring Chemistry Statistics for Each Watershed. (Page 2 of 5)

		Belmont Pump					Bouton Creek					Los Cerritos Channel					Dominguez Gap				
	Achieved			Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Reporting Limit	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
DISSOLVED METALS (µg/L) (continued)																					
Mercury	0.2	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Nickel	1	4	100	4.1	2.8	0.67	4	100	2	2.0	0.40	5	100	4.0	3.1	0.56	3	67	1.6	1.6	0.22
Zinc	5.0-50	4	100	157	83	0.94	4	100	83	56	0.69	5	100	88	69	0.52	3	100	25	24	0.17
CHLORINATED PESTICIDES (µg/L)																					
Aldrin	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Alpha-BHC	0.05	4	25	ID	ID	ID	4	0	ID	ID	ID	5	20	ID	ID	ID	3	0	ID	ID	ID
beta-BHC	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	20	ID	ID	ID	3	33	ID	ID	ID
Delta-BHC	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
gamma-BHC (lindane)	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Alpha-Chlordane	0.50	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
gamma-Chlordane	0.50	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4,4'-DDD	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4,4'-DDE	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4,4'-DDT	0.05-0.1	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Dieldrin	0.10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Endosulfan I	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Endosulfan II	0.05-0.1	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Endosulfan sulfate	0.10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Endrin	0.10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Endrin Aldehyde	0.10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Endrin Ketone	0.10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Heptachlor	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Heptachlor Epoxide	0.05	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Methoxychlor	0.50	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Toxaphene	1.00	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Total PCBs	1.00	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
CARBAMATE & UREA PESTICIDES (µg/L)																					
Oxamyl	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Methomyl	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Fenuron	4	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Monuron	4	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Propoxur	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Carbofuran	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Carbaryl	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Flumeturon	4	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Diuron	4	4	0	ID	ID	ID	4	0	ID	ID	ID	5	20	ID	ID	ID	3	0	ID	ID	ID
Propham	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Siduron	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Methiocarb	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Linuron	4	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Swep	4	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Chlorpropham	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Brabane	10	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Neburon	4	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
AROCLORS (µg/L)																					
Aroclor-1016	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Aroclor-1221	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Aroclor-1232	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Aroclor-1242	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Aroclor-1248	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Aroclor-1254	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Aroclor-1260	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID

Table 8.2 Storm Water Monitoring Chemistry Statistics for Each Watershed. (Page 3 of 5)

		Belmont Pump					Bouton Creek					Los Cerritos Channel					Dominguez Gap				
	Achieved			Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Reporting Limit	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
ORGANOPHOSPHATE PESTICIDES (µg/L)																					
Azinphos methyl	1.0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Bolstar	0.05	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Coumaphos	1.0	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Demeton O & S	0.1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Diazinon	0.01-1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	20	ID	ID	ID	3	0	ID	ID	ID
Dicholorvoz	0.01	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Disulfoton	0.1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Dursban (chlorpyrifos)	0.05-1	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Ethoprop	0.05	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Fensulfothion	0.1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Fenthion	0.1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Merphos	0.05	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Malathion	0.1-1	4	0	ID	ID	ID	4	0	ID	ID	ID	5	20	ID	ID	ID	3	0	ID	ID	ID
Mevinphos	0.1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Parathion methyl	0.05	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Phorate	0.1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Ronnel	0.1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Stirophos	0.05	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Tokuthion	0.05	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Tricholronate	0.1	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	1	0	ID	ID	ID	0	NA	NA	NA	NA
Prometryn	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Atrazine	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Simazine	1.0	4	0	ID	ID	ID	4	25	ID	ID	ID	5	20	ID	ID	ID	3	0	ID	ID	ID
Cyanazine	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
HERBICIDES (µg/L)																					
Dalapon	2.0-3.1	4	0	ID	ID	ID	3	0	ID	ID	ID	4	0	ID	ID	ID	3	0	ID	ID	ID
Dicamba	0.20-0.50	4	0	ID	ID	ID	3	0	ID	ID	ID	4	25	ID	ID	ID	3	0	ID	ID	ID
MCPP	20-250	4	25	ID	ID	ID	3	33	ID	ID	ID	4	0	ID	ID	ID	3	0	ID	ID	ID
MCPA	20-250	4	25	ID	ID	ID	3	0	ID	ID	ID	4	0	ID	ID	ID	3	0	ID	ID	ID
Dichlorprop	0.2-1	4	0	ID	ID	ID	3	33	ID	ID	ID	4	0	ID	ID	ID	3	0	ID	ID	ID
2,4-D	0.20-2.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	20	ID	ID	ID	3	33	ID	ID	ID
2,4,5-TP-Silvex	0.20-0.50	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,4,5-T	0.20-1.0	4	0	ID	ID	ID	3	0	ID	ID	ID	4	0	ID	ID	ID	3	0	ID	ID	ID
2,4-DB	0.20-20.0*	4	50	1.8	0.9	1.01	3	33	ID	ID	ID	4	25	ID	ID	ID	3	33	ID	ID	ID
Dinoseb	0.22-10.0*	4	0	ID	ID	ID	3	0	ID	ID	ID	4	0	ID	ID	ID	3	0	ID	ID	ID
Bentazon	1.0-20.0*	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Glyphosate	5-10.0	4	50	13	11	0.44	4	25	ID	ID	ID	5	60	30	6.7	1.86	3	0	ID	ID	ID
SEMIVOLATILES (µg/L)																					
Acenapthene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Acenaphthylene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Acetophenone	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Aniline	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Anthracene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4-Aminobiphenyl	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Benzidine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Benzo(a)anthracene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Benzo(b)fluoranthene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Benzo(k)fluoranthene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Benzo(a)pyrene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Benzyl butyl phthalate	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Bis(2-chloroethyl)ether	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Bis(2-chloroethoxy)methane	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID

Table 8.2 Storm Water Monitoring Chemistry Statistics for Each Watershed. (Page 4 of 5)

		Belmont Pump					Bouton Creek					Los Cerritos Channel					Dominguez Gap				
				Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics		
ANALYTE	Achieved Reporting Limit	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV	No. of Samples	Percent Detect	Mean	Median	CV
SEMIVOLATILES (µg/L) (continued).																					
Bis(2-ethylhexyl)phthalate	3.0	4	100		13	0.22	4	100	47	11	1.79	5	80	13	13	0.25	3	100	11	8.0	0.64
4-Chloroaniline	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
1-Chloronaphthalene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2-Chloronaphthalene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4-Chlorophenyl phenyl ether	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Chrysene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
p-Dimethylaminoazobenzene	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
7,12-Dimethylbenz(a)-anthracene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
a-,a-Dimethylphenethylamine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Dibenz(a,j)acridine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Dibenz(a,h)anthracene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
1,3-Dichlorobenzene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
1,2-Dichlorobenzene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
1,4-Dichlorobenzene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
3,3-Dichlorobenzidine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Diethyl phthalate	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Dimethyl phthalate	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Di-n-butylphthalate	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,4-Dinitrotoluene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,6-Dinitrotoluene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Diphenylamine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
1,2-Diphenylhydrazine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Di-n-octylphthalate	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Ethyl methanesulfonate	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Endrin ketone	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Fluoranthene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Fluorene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Hexachlorobenzene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Hexachlorobutadiene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Hexachlorocyclopentadiene	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Hexachloroethane	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Indeno[1,2,3-cd]pyrene	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Isophorone	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
3-Methylcholanthrene	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Methyl methanesulfonate	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Napthalene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
1-Napthylamine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2-Napthylamine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2-Nitroaniline	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
3-Nitroaniline	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4-Nitroaniline	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Nitrobenzene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
N-Nitrosodimethylamine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
N-Nitrosodiphenylamine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
N-Nitroso-di-n-propylamine	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID

Table 8.2 Storm Water Monitoring Chemistry Statistics for Each Watershed. (Page 5 of 5)

		Belmont Pump					Bouton Creek					Los Cerritos Channel					Dominguez Gap				
	Achieved			Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics					Log-Normal Statistics		
	Reporting	No. of	Percent				No. of	Percent				No. of	Percent				No. of	Percent			
ANALYTE	Limit	Samples	Detect	Mean	Median	CV	Samples	Detect	Mean	Median	CV	Samples	Detect	Mean	Median	CV	Samples	Detect	Mean	Median	CV
SEMIVOLATILES (µg/L) (continued).																					
N-Nitrosopiperidine	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Pentachlorobenzene	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Phenacitin	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Phenanthrene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2-Picoline	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Pronamide	5.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Pyrene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
1,2,4,5-Tetrachlorobenzene	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
1,2,4-Trichlorobenzene	0.5	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Benzoic Acid	5.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Benzyl Alcohol	5.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4-Chloro-3-methylphenol	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2-Chlorophenol	2.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,4-Dichlorophenol	2.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,6-Dichlorophenol	2.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,4-Dimethylphenol	2.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,4-Dinitrophenol	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2-Methyl-4,6-dinitrophenol	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2-Methylphenol	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4-Methylphenol	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2-Nitrophenol	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
4-Nitrophenol	3.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Pentachlorophenol	2.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
Phenol	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,3,4,6-Tetrachlorophenol	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,4,5-Trichlorophenol	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID
2,4,6-Trichlorophenol	1.0	4	0	ID	ID	ID	4	0	ID	ID	ID	5	0	ID	ID	ID	3	0	ID	ID	ID

CV = Coefficient of variance.
ID = Insufficient data.
NA = Not Analyzed
* Due to matrix interference in storm 5, detection limits are unusually high.

8.2 Dry Season Water Quality

8.2.1 Chemical Analysis of Dry Weather Samples from Mass Emission Sites

In general, chemical results did not vary greatly between sites or sampling dates (Table 6.5). Contaminant concentrations present were much as expected for storm drainage water, and with a few exceptions, no parameters stood out as particularly high. Pesticides and semivolatiles were largely undetected. Concentrations of metals were generally low and hardness was high which would tend to mitigate toxicity.

A few dissolved metals including copper and lead occur at levels similar to those measured during the winter storm events (Table 6.2). Concentrations of dissolved nickel measured in June 2001 at all three sites were higher than any reported in association with storm water monitoring. These concentrations, however, were well within CTR freshwater water quality criteria due to relatively high hardness values (160 to 1500 mg/L).

Repeated dry weather sampling in Bouton Creek during the summer of 2000 indicated that pH levels were commonly in excess of 9.0. Samples during the second survey during the summer of 2000 had a pH of 9.8. During a followup survey conducted in July 2000, pH measurements were reported at 10.6. The cause of these periodic excursions has not been determined. Measurements of pH taken during the only survey conducted in 2001 indicate that levels were more consistent with those found in natural waters.

During the June 2001 dry weather survey in Bouton Creek, COD was reported at 3700 mg/L. Laboratory duplicates were conducted that confirmed this value but none of the other chemical measurements suggested that this was a valid measurement. The sample also had a chloride content that was twice as high as recommended for use of a standard COD test. As a result, this measurement is considered to be an outlier.

8.2.2 Bacteriological Data from Alamitos Bay

Microbiological contamination in Alamitos Bay is a major concern during summer months when bathers are utilizing local beaches. Due to these concerns, the City constructed a low flow diversion for Drainage Basin 24 to prevent dry weather flows from entering the Bay from this Drainage Basin. The low-flow diversion was activated on May 1, 2000. Prior to activation of the diversion, dry weather flows were discharged at the Bayshore Aquatic Park on the southwestern shoreline of Alamitos Bay. This program has now sampled total coliform, fecal coliform, and fecal streptococcus in Alamitos Bay near the discharge point for Basin 24 once prior to activation of the dry weather intercept and three times during dry weather periods subsequent to activation of the low-flow intercept (Tables 6.3 and 6.4). Since a single baseline data point and three post-implementation data points are insufficient to evaluate effectiveness of the diversion, alternative data sources were investigated. An ongoing microbiological monitoring being conducted by the City of Long Beach Health was identified that was able to provide additional baseline and post-implementation data.

The City of Long Beach Department of Health and Human Services (Ms. Mae Nikaido) provided microbiological data from monitoring conducted in Alamitos Bay since 1997. Historical data exist for total coliform, fecal coliform (or *Escherichia coli)* and enterococcus at five locations. As of January 2000, the Department of Health and Human Services switched from using fecal coliform to use of *E. coli* as a surrogate from fecal coliform. The length of data records varies among the sites but the most complete survey records start in March 1999. The monitoring sites are shown in Figure 8.1 and are listed below starting from sites within Los Cerritos Creek and proceeding towards the entrance of the Bay:

B27 Los Cerritos Creek by Golden Sail (Near mouth of Los Cerritos Cr.)
B28 Long Beach Rowing Association (Near Los Cerritos Cr. and Marine Station)
B67 Bayshore and Second St. Bridge (Near outlet of Belmont site)
B29 First and Bayshore (Nearest our Station -end of East First Street and Bayshore Ave.)
B14 Bayshore Float (Out close to Mouth, North of spit of E. Bayshore Walk)

The B29 monitoring site is located at the Bayshore Aquatic Park a short distance from the Alamitos Bay receiving water site monitored as part of the City's stormwater program.

Department of Health and Human Services monitoring data were compared with historical rainfall records from the Long Beach Airport. Microbiological data from extended dry weather conditions occurring between late spring and early fall of each year were extracted from the data set and summarized in Table 8.3. This summary identifies the dry weather period for each year, the total number of measurements taken during each dry weather period and the percentage of measurements exceeding Ocean Plan and AB411 reference values. For visual inspection of these data, time-series plots are given as Figures 8.2, 8.3, and 8.4 for three of the selected bacteriological stations (B67 - Bayshore and Second St. Bridge (Near outlet of Belmont site); B29 - First and Bayshore (Nearest our Station -end of East First Street and Bayshore Ave.); and B14 - Bayshore Float (Out close to Mouth, North of spit of E. Bayshore Walk).

No strong trends are evident in the data set, however, the available data suggest that upstream bacterial concentrations at B27 and B28 are often low in comparison to other sites. Concentrations of fecal coliform most frequently exceed reference levels at the B67 and B29 monitoring sites. Enterococcus bacteria were only tested at the three sites closest to the ocean during the 1999 and 2000 dry weather seasons. During the 1999 dry weather season, reference levels were most commonly exceeded at the B67 monitoring site. During the 2000 dry weather season, excursions above reference levels were most common near the mouth of Alamitos Bay at the B14 monitoring site.

Microbiological data from the City's storm water program demonstrate relatively low levels of total coliform, fecal coliform, and fecal streptococcus during all dry weather periods including the pre-implementation survey and each of the three post-implementation dry weather surveys. Tests conducted during wet weather periods resulted in levels of each bacterial component that were one to two orders of magnitude higher that during summer dry weather periods.

Based upon all available data, it is not apparent that the dry weather interceptor in Basin 24 has had any discernable impact on the bacterial concentrations in Alamitos Bay during the extended dry weather during the summer of 2000.

Table 8.3 Number of Measurements of Microbiological Indicator Organisms and Percent of Samples Exceeding Ocean Plan and AB411 reference values during Extended Dry Weather Periods from 1997 though 2000.

	May 1-Sep 15, 1997			May 16-Nov 1, 1998			Jun 15-Nov 5,1999			Apr 20-Oct 10, 2000		
	n[1]	OP(%)[2]	AB411(%)[3]	n	OP(%)	AB411(%)	n	OP(%)	AB411(%)	n	OP(%)	AB411(%)
Total Coliform												
B27	4	0	0	6	0	0	5	0	0	6	0	0
B28	5	0	0	6	0	0	5	0	0	6	0	0
B67							22	9	0	24	8	0
B29							22	0	0	25	8	4
B14	9	0	0	11	0	0	21	0	0	22	5	0
Fecal Coliform or E. coli[4]												
B27							5	0	0	6	0	0
B28							5	0	0	6	0	0
B67							22	5	0	26	12	4
B29							22	0	0	25	12	4
B14							21	0	0	25	4	0
Enterococcus												
B27	4	0	0									
B28	3	0	0									
B67							24	21	17	27	7	7
B29							20	0	0	26	12	0
B14							22	5	5	25	44	24

1. n=number of measurements during time period
2. OP=Ocean Plan 30-day average
   Total Coliforms: 1000 per 100 ml
   Fecal Coliforms: 200 per 100 ml
   Enterococcus: 35 per 100 ml
3. AB411= Assembly Bill 411 Single Sample Criteria
   Total Coliforms: 10,000 per 100 ml
   Total Coliforms: 1000 per 100 ml if ratio of fecal to total coliforms is greater than 0.1
   Fecal Coliforms: 400 per 100 ml
   Enterococcus: 104 per 100 ml
4. ***Escherichia coli*** was used as surrogate for fecal coliform starting in January 2000. Since a correction factor was not available, ***E. coli*** measurements were compared directly with Fecal Coliform criteria.

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Historical Bacteria Study Sites

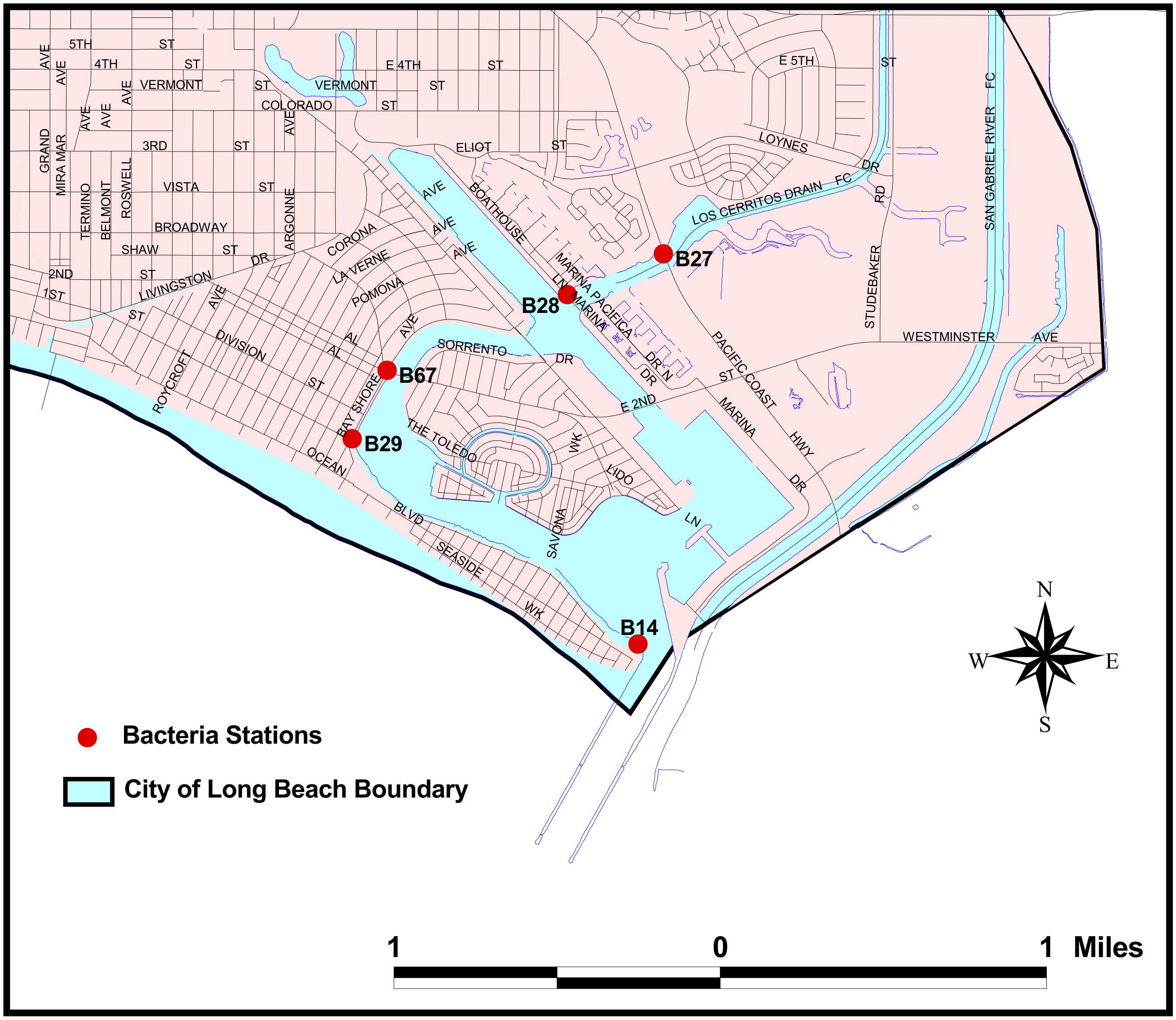
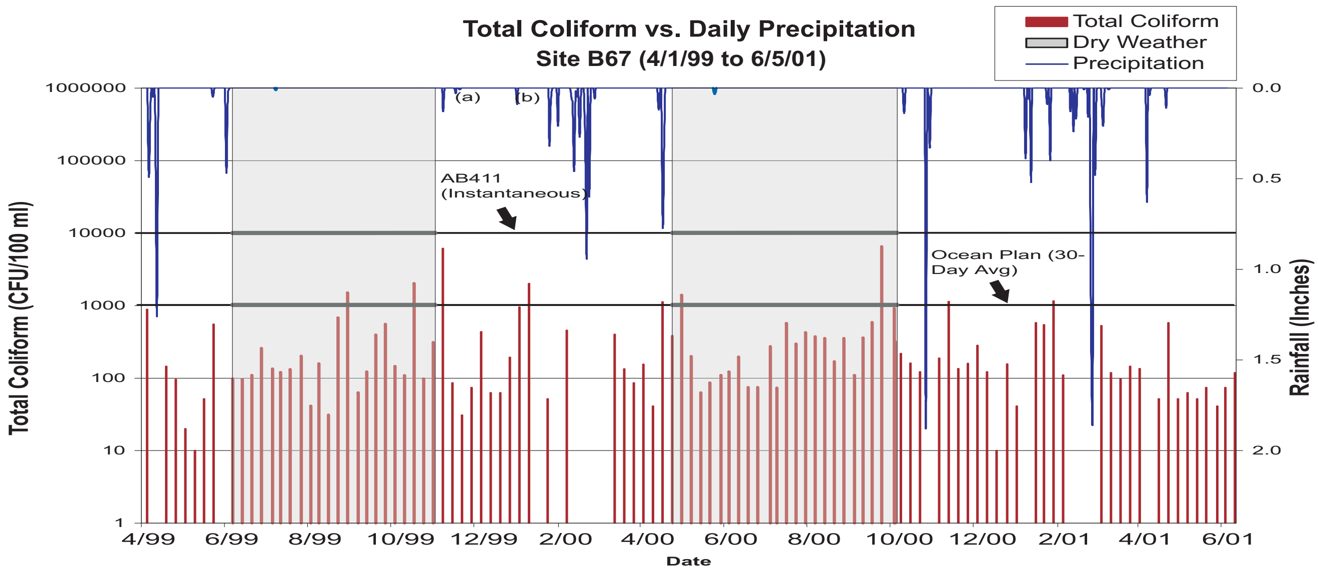
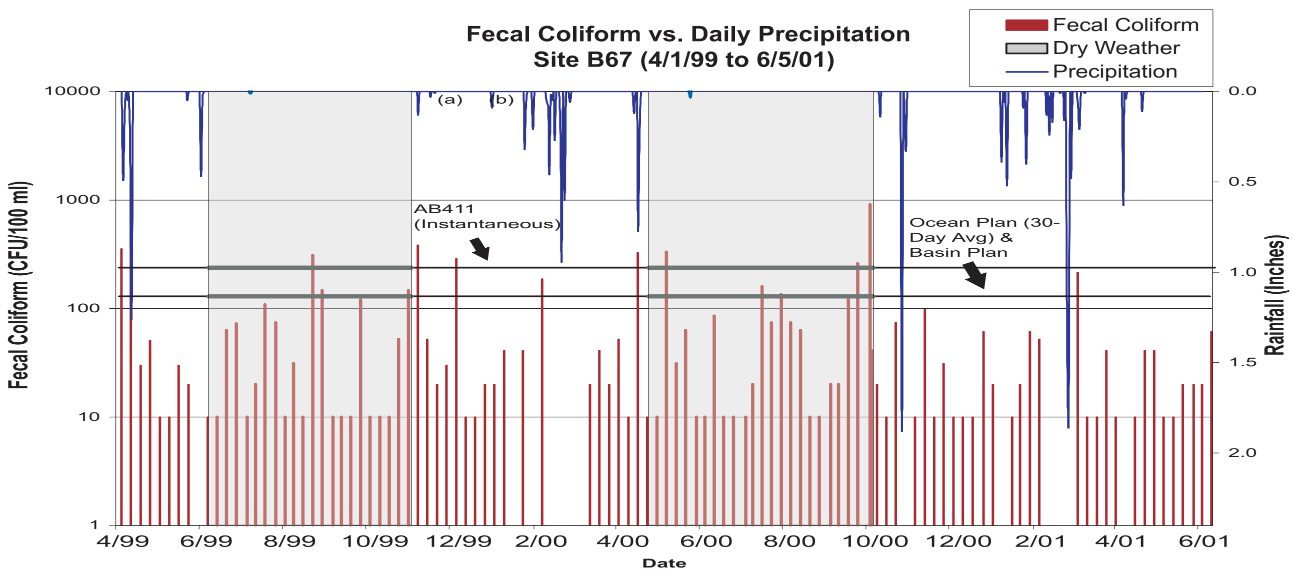


Figure 8.1. Previous Bacteria Study Sites.

Figure 8.2 Bacterial Time Series for City of Long Beach Alamitos Bay Bacteria Station 67 (Bayshore and Second Street Bridge).





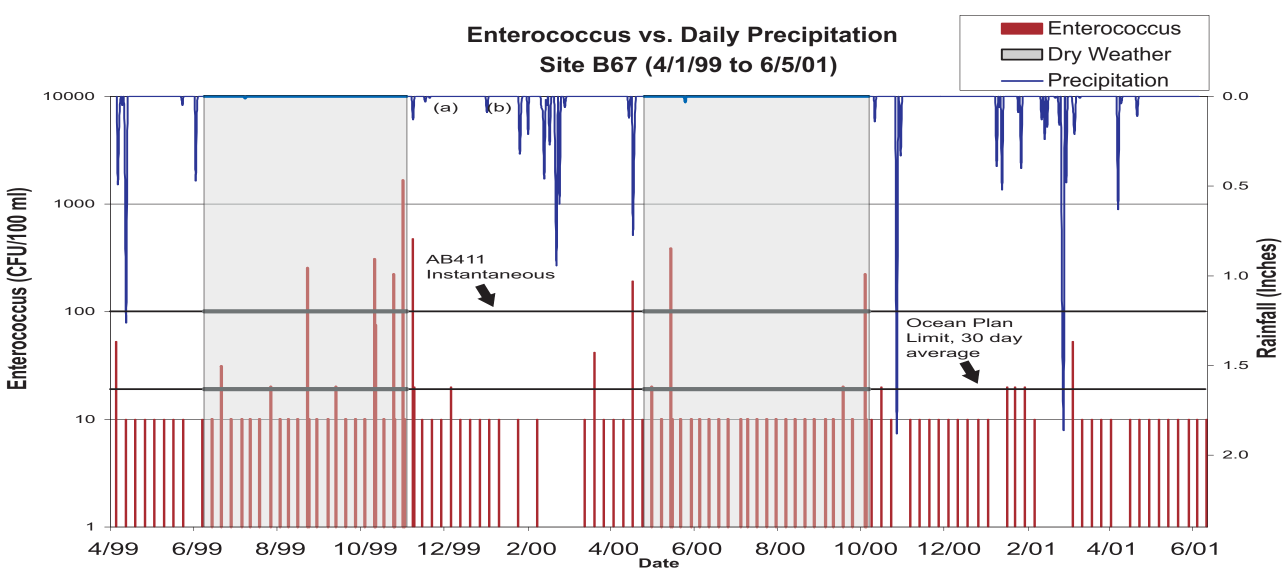
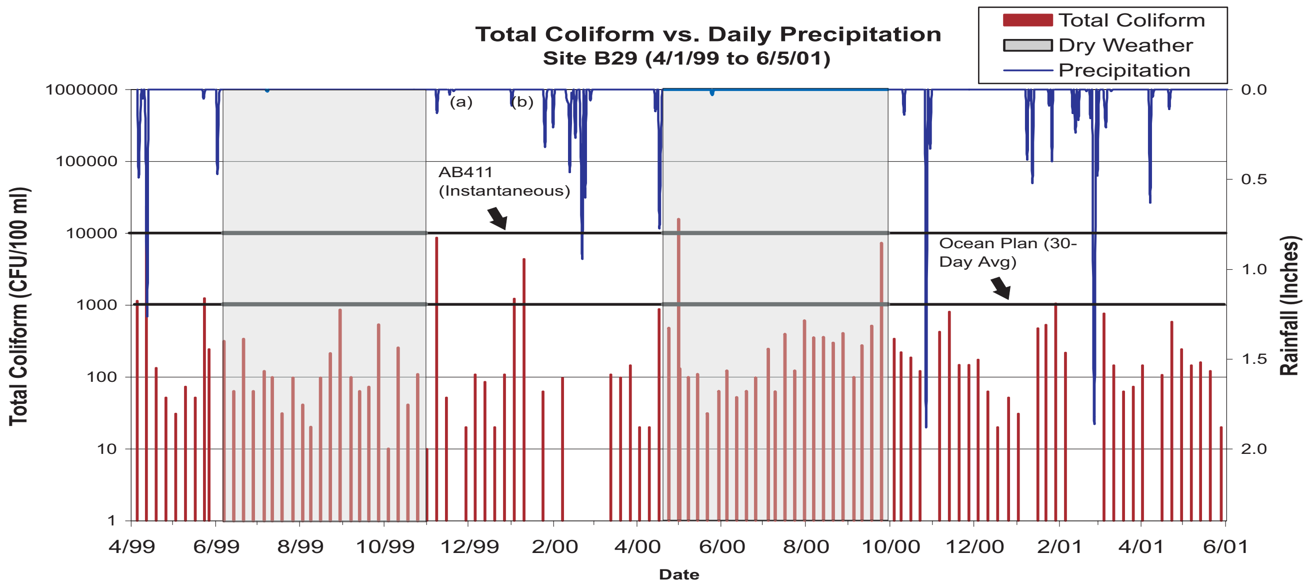
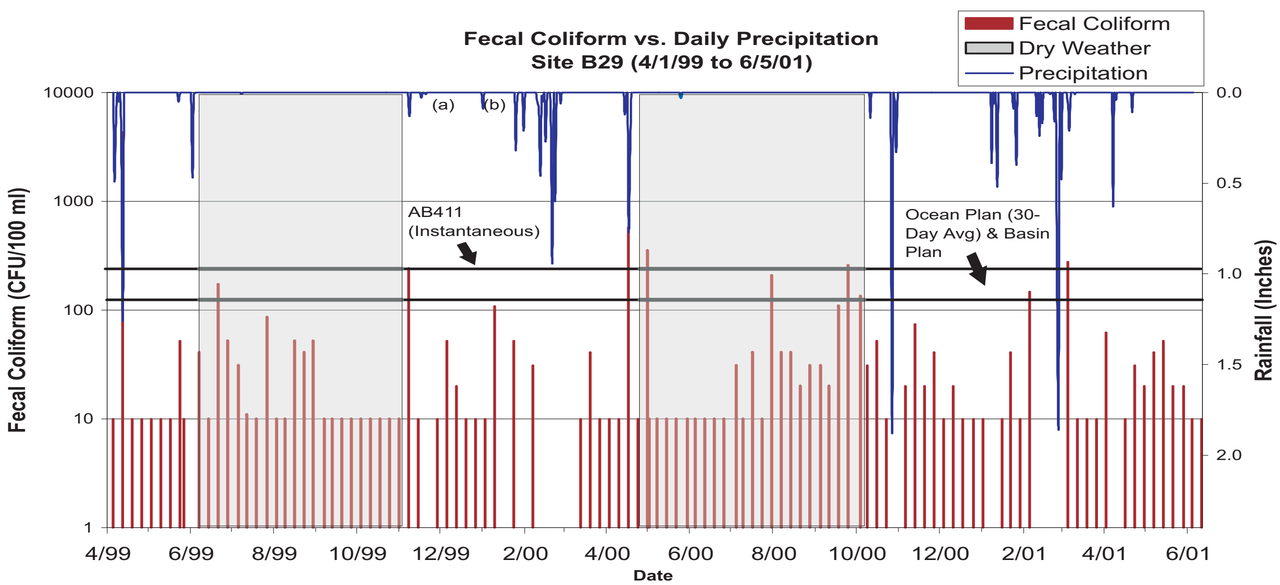


Figure 8.3 Bacterial Time Series for City of Long Beach Alamitos Bay Bacteria Station 29 (First and Bayshore).





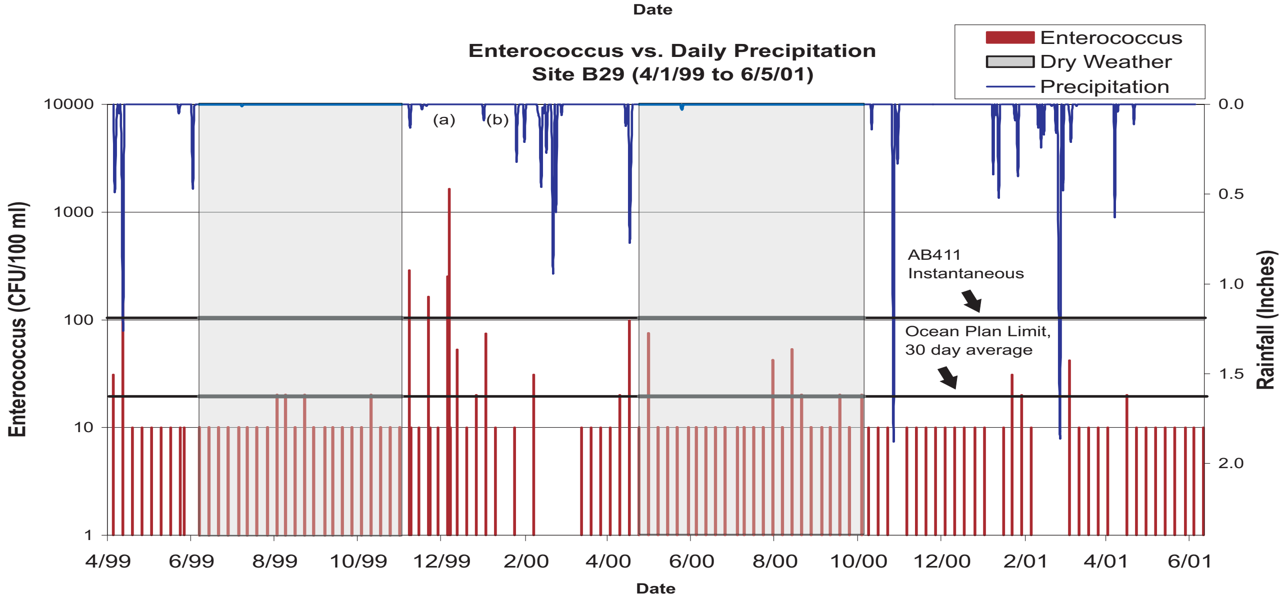
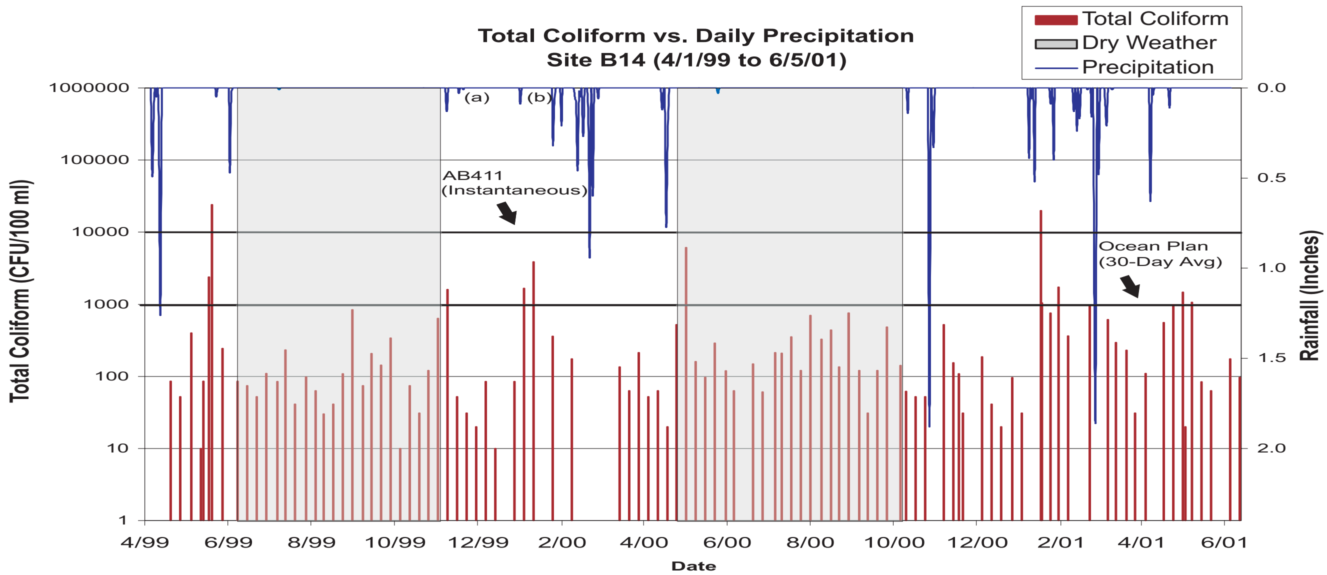
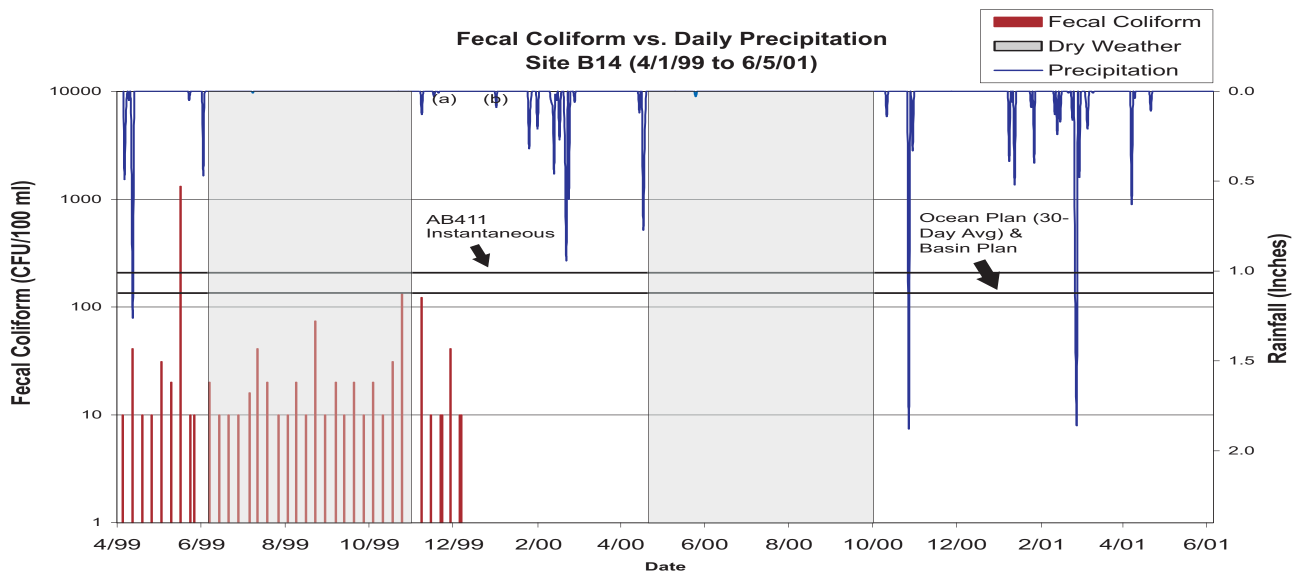
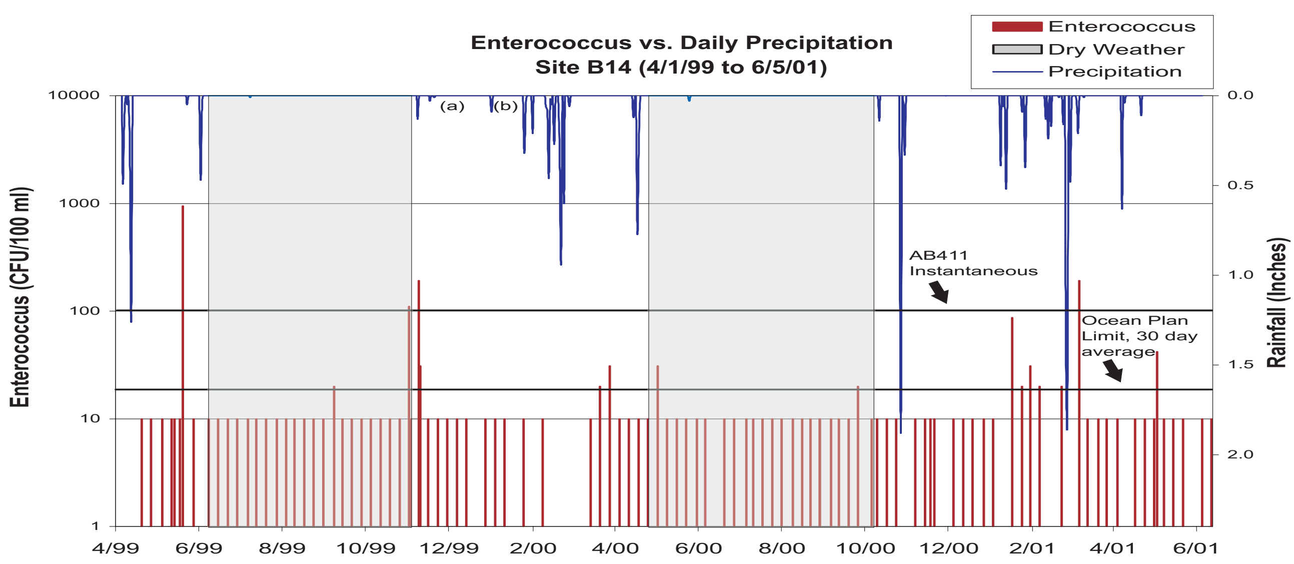


Figure 8.4 Bacterial Time Series for City of Long Beach Alamitos Bay Bacteria Station 14 (Bayshore Float).







8.3 Storm Water Toxicity

The toxicity characteristics of the wet weather samples varied among sites. All five samples from the Los Cerritos Channel station caused toxicity to at least two of the species. The Belmont Pump Station had a similar pattern, with three of the four samples being toxic to multiple species. While all four samples from Bouton Creek were toxic, only one species was affected on two occasions. The Dominguez Gap Pump Station site was toxic on only two of the three sampling events and in both cases was only toxic to the sea urchin test. These different patterns for the sites indicate that the constituents causing the toxicity are likely to be different, especially between the Dominguez Gap station and the other three. The lack of substantial toxicity at Dominguez Gap may in part be due to the sampling location itself. A large amount of water must accumulate in the basin at this location before the pump starts and a sample can be collected. Contaminants may bind to particles and settle out or volatile components may be lost to the atmosphere during the time that water is accumulating, thus reducing the toxicity of the water.

The frequency and magnitude of toxicity was similar between the Cerritos Channel and Belmont Pump Station sites. The two most toxic samples in the study were the Belmont Pump Station sample collected April 7, 2001 and the Cerritos Channel sample from April 21, 2001. Both of these samples caused toxic effects to all three species, indicating that either very high concentrations of a toxicant are present or that toxicity may be caused by more than one class of toxicant (e.g. metals and organics).

8.3.1 Receiving Water Toxicity

No significant toxicity was present in any of the Alamitos Bay receiving water samples. These results are consistent with three dry weather samples collected from the same site in 2000. Salinity measurements indicated that the wet weather receiving water samples contained only about 10% freshwater. The lack of toxicity in the Alamitos Bay samples is consistent with the results of the wet weather discharge samples, which usually had NOEC values greater than 10%.

The results of the receiving water sample analyses should not be used to describe water quality throughout Alamitos Bay. Test samples were collected from only one location in the bay and the results may therefore not be representative of other locations in Alamitos Bay, especially those areas located near major storm water discharges.

8.3.2 Temporal Toxicity Patterns

There was a large variation in the amount of toxicity observed between storms at any given runoff site. For example, the toxicity of the Los Cerritos Channel storm water samples to sea urchins varied from 4 TUc in the 27 January sample to >16 TUc on 21 April (Table 7.3). The length of the antecedent period (dry period between storms) appeared to be related to the severity of the toxicity of the samples. The samples collected on 25 February from the Belmont Pump Station and Bouton Creek exhibited the low levels of toxicity and these samples also had the shortest antecedent period (1 day). In contrast, samples collected from the Belmont Pump Station and Bouton Creek on 7 April had the longest antecedent period (28 days) and contained the most toxicity. The magnitude of toxicity (expressed as chronic toxic units) was significantly correlated with antecedent period for water flea survival ($p < 0.05$); the correlation with sea urchin fertilization was nearly statistically significant ($p < 0.07$). No correlation was found for the mysid endpoints, but this was likely due to there being few samples where this test detected toxicity.

Stronger correlations may have been obtained had it been possible to analyze samples from the beginning of the storm season, when much longer antecedent periods were present. In previous studies, it was found that early season storm water runoff from Ballona Creek was more toxic than samples later in the season (Bay *et al.* 1999).

Temporal differences in toxicity also appeared to be related to the size of the storm event. Statistical analysis of the toxicity data with the total rainfall data found significant negative correlations ($p < 0.05$) for all of the test species and endpoints, indicating that toxicity decreased as rainfall increased. A trend toward decreasing toxicity with increased total flow of the runoff was also found, but was not statistically significant. The results of this study indicate that larger storms may be diluting the concentration of toxic constituents in the runoff and causing less toxicity. This may further explain the lack of toxicity at the Dominguez Gap site, where samples could only be collected after relatively large amounts of rainfall. There was no correlation between maximum intensity of rainfall and toxicity.

8.3.3 Comparative Sensitivity of Test Species

Differences in sensitivities amongst the species were observed during the study. Except for a few samples, the sea urchin fertilization test was the most sensitive toxicity test method. In those few cases, water flea survival was the most sensitive indicator and was the second most sensitive for the remaining samples. There were no cases where mysid survival was the most sensitive test method. This same pattern of sea urchin > water flea > mysid was also observed during the 2000 dry weather sampling (Kinnetic Laboratories Incorporated 2000) and in a study in urban storm water toxicity in San Diego (Southern California Coastal Water Research Project 1999).

The sensitivity of each test species to individual chemical constituents may vary, thus the species-specific pattern of response to the storm water samples may indicate cause of toxicity. The sea urchin fertilization test is insensitive to organophosphorus pesticides, but the water flea is one the most sensitive aquatic species to diazinon. By contrast, sea urchin sperm are approximately 10 times more sensitive to trace metals than are water fleas. Thus, samples where the water fleas were most affected may have an organic compound as the primary toxicant, while metals are likely to be of greater concern in samples that are more toxic to sea urchins.

The two sublethal endpoints, mysid weight and water flea reproduction, were rarely more sensitive indicators than was survival. Many of the samples produced an enhancement of water flea reproduction relative to the controls in the low concentrations and then a decrease in reproduction at higher concentrations. The cause of this enhancement in reproduction is unknown, but may have been caused by the presence of nutrients in the storm water.

8.3.4 Toxicity Characterization

Correlation analysis of the toxicity and chemistry data indicate that the toxic responses measured in this study are related to the chemical composition of the storm water samples. The toxic responses of all three test species were significantly correlated with increased concentrations of some of the measured storm water constituents (Table 8.4). Sea urchin fertilization, the most sensitive test method used, showed significant correlations with the dissolved fractions of cadmium, copper, and zinc. The mysid and water flea test results also showed highly significant correlations with multiple trace metals. Reduced water flea survival and reproduction also showed a significant correlation with increased dissolved organic carbon content of the samples and also increased concentrations of the herbicide glyphosate (Table 8.4).

Table 8.4. Nonparametric Spearman correlation coefficients showing the relationship between change in chemical concentration and toxic units for each toxicity test. Toxic units are based on the median response (EC50), except for the mysid survival test, where the toxic units are based on the NOEC. Values in bold are statistically significant at p≤0.05 (*) or p≤0.01 (**).

		Sea Urchin	Mysid	Water Flea	
		Fertilization	Survival	Survival	Reproduction
Constituent		TUa	TUc	TUa	TUa
TSS		0.027	0.087	0.373	0.440
TDS		-0.026	0.209	0.362	0.400
TOC		0.265	0.365	**0.721** **	**0.776** **
Aluminum	Total	-0.009	-0.087	0.192	0.247
	Dissolved	0.064	-0.018	-0.262	-0.300
Arsenic	Total	-0.270	-0.017	0.244	0.356
	Dissolved	-0.135	-0.140	0.029	0.119
Cadmium	Total	0.382	0.453	**0.811** **	**0.810** **
	Dissolved	**0.707** **	**0.548** *	0.401	0.337
Chromium	Total	0.188	0.157	**0.736** **	**0.754** **
	Dissolved	**0.592** *	**0.502** *	**0.846** **	**0.758** **
Copper	Total	0.319	**0.576** *	**0.661** **	**0.612** *
	Dissolved	**0.716** **	**0.632** **	0.480	0.306
Lead	Total	0.128	0.296	0.374	0.380
	Dissolved	0.339	0.495	0.056	-0.026
Nickel	Total	0.327	**0.504** *	**0.824** **	**0.826** **
	Dissolved	0.490	**0.540** *	**0.784** **	**0.667** **
Zinc	Total	0.417	**0.504** *	**0.884** **	**0.875** **
	Dissolved	**0.577** *	**0.643** **	**0.852** **	**0.753** **
Glyphosate	Total	0.314	0.359	**0.704** **	**0.759** **

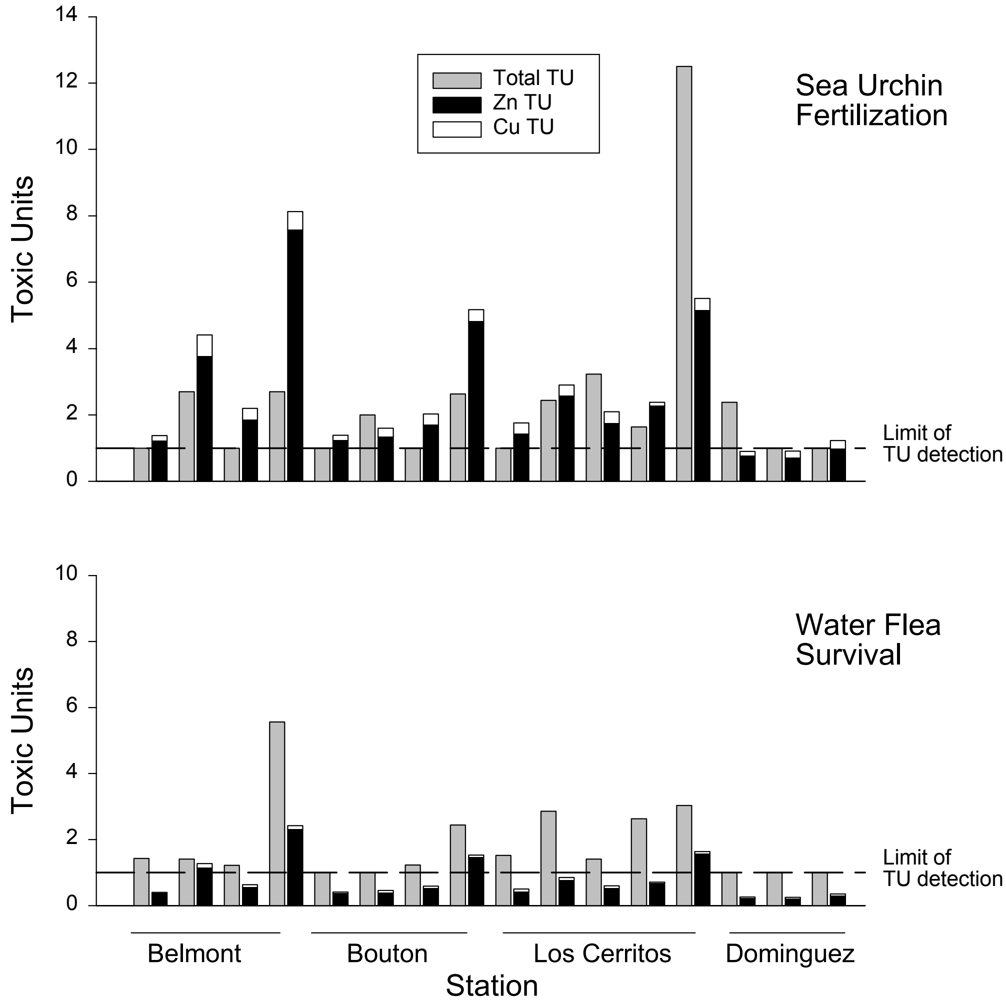


Figure 8.5. Comparison of measured (total) toxic units and toxic units estimated from the dissolved concentrations of copper and zinc in the test samples. Measured toxic units are based on the EC50 (100/EC50). A value of 1 toxic unit was assigned to low/nontoxic samples having an estimated EC50 of >100%.

The presence of significant correlations between toxicity and selected chemicals provides information to help identify key constituents of concern, but the statistical results do not prove that those constituents are the cause of toxicity. The true cause of toxicity may be another (possibly unmeasured) constituent that has a similar pattern of occurrence in the samples. For example, some organic constituents such as the highly toxic organophosphate pesticides were not detected in these samples and thus no correlation analyses were conducted. The op pesticide detection limits achieved in this study were above the toxic thresholds for the water flea, thus it cannot be determined whether these constituents played a role in the toxicity that was measured. The significant correlation between water flea toxicity and glyphosate, which is a widely used residential herbicide, may actually represent the effects of another unmeasured constituent (e.g., op pesticides) that has a similar pattern of occurrence in the storm water samples tested.

Toxicity identification evaluations (TIEs) are currently the most effective method for determining which storm water constituents are causing toxicity. TIE analyses were not conducted for the mysid and water flea tests because the magnitude of toxicity present was below the trigger level established for this study.

Sufficient toxicity to sea urchins was present to permit TIE analysis, however. These analyses supported the correlation results and indicated that trace metals, specifically zinc and copper were the primary toxic constituents present. For all three samples where TIEs were performed, EDTA was the most effective treatment for removing toxicity. EDTA is effective at chelating divalent metals, such as copper, cadmium and zinc, thus rendering them biologically unavailable. Studies in other watersheds have also found EDTA to be successful at removing toxicity from runoff (Jirik *et al.* 1998, Schiff *et al.* 2001). In these studies, copper and zinc were found to be the specific metals most likely causing toxicity.

Verification of the importance of zinc and copper for influencing the toxicity of Long Beach storm water to sea urchins is shown by comparing the measured and predicted toxic units of the samples (Figure 8.1). For nearly every sample that contained a substantial amount of toxicity (total toxic units >1), sufficient dissolved zinc and copper was measured in the sample to account for all of the toxicity measured. Cadmium and chromium, though significantly correlated with reduced sea urchin fertilization, are not expected to be a significant cause of toxicity. Previous SCCWRP research has shown that these two metals have relatively low toxicity to sea urchin sperm, with EC50s of 18 and >100 mg/L for cadmium and hexavalent chromium, respectively. The measured concentrations of these two metals in Long Beach storm water were several orders of magnitude below the toxic concentrations.

Comparison of the measured and predicted toxic units for the water flea tests showed a different pattern from that obtained for the sea urchin tests (Figure 8.1). Concentrations of zinc and copper were not sufficient to account for the measured toxicity in most of the samples, indicating that additional unmeasured constituents are important causes of toxicity to this species.

The effectiveness of some of the additional sea urchin TIE treatments suggest that there may be other toxic constituents present in the storm water samples. Solid phase extraction using C-18 was effective at removing toxicity from the April 7 samples collected from Cerritos and Belmont. This treatment is intended to remove non-polar organic contaminants from the sample. However, in a previous study it was found that the C-18 treatment also removed significant amounts of copper and zinc from the sample (Schiff *et al.* 2001). Since both solid phase extraction and EDTA removed all of the toxicity in the April 7 samples, it is likely that the observed toxicity was caused by divalent metals, rather than organics. The other possibility is that both metals and non-polar organics are present and acting in a synergistic manner so that the removal of one effectively eliminates toxicity.

The removal of toxicity by centrifugation of the Cerritos Channel sample from February 23 was an unusual result. This treatment was not effective on either of the April 7 samples nor has it been found to be very effective in TIEs on other watersheds (Bay *et al.* 1999). There are two potential mechanisms by which particles could cause toxicity. One mechanism is physical interruption of the fertilization process by the particles themselves. This mechanism is unlikely, as SCCWRP has tested other storm water samples that contained similar or greater concentrations of particles and TIE analyses did not indicate particle-associated toxicity was present. The second mechanism whereby particles can produce toxicity is from the desorption of contaminants bound to the particles into the water. A previous study found that urban storm water particles released toxic quantities of unidentified materials into clean seawater in less than 24 hours (Noblet *et al.* 2001).

8.3.5 Relative Toxicity of Storm Water

Dry weather samples were tested from the Belmont pump and Bouton Creek stations in June 2000. Toxicity results showed a similar pattern between wet and dry weather in that levels of response were variable between samples and the relative sensitivity of the test species were the same (Kinnetic Laboratories Incorporated 2000). The most toxic of the wet weather samples from Belmont was only a little more toxic than the dry weather sample. The most toxic Bouton wet weather sample was, however, much more toxic than the dry weather sample. The main difference between the wet and dry weather testing was that every wet weather sample from these two stations caused a toxic response to a least one endpoint, but the dry weather samples did not always produce toxicity.

The frequency and magnitude of storm water toxicity from the Long Beach stations is similar to observed in samples from other southern California watersheds (Table 8.5). Results from the Chollas Creek and Ballona Creek studies are probably most similar to the Long Beach study, as these samples were obtained from smaller, highly urbanized watersheds sites than were the samples from the L.A. River and San Gabriel River studies. As with the Long Beach samples, toxicity in other watersheds is variable among storms, and storm water toxicity is usually detected using the sea urchin fertilization test.

Table 8.5. Summary of Toxicity Characteristics of Storm Water from Other Southern California Watersheds. (Test Types: SF = sea urchin fertilization, MS = Mysid Survival, DS = Daphnid Survival)

Location	Date	Test Type	Number of Storms	%Toxic	NOEC	EC50
Los Angeles River	1997-99	SF	4	100	12-25	24->50
San Gabriel River	1997-99	SF	4	50	25-≥50	32->50
Ballona Creek	1996-97	SF	13	85	3-≥25	3->50
Chollas Creek	1999-2000	SF	5	100	3-12	18-47
Chollas Creek	1999	MS	3	0	≥100	>100
Chollas Creek	1999	DS	3	67	50-≥100	75->100

8.4 Dry Season Toxicity

The toxicity results indicate that substantial short-term variability is present in the composition of dry weather discharge from both the Belmont and Bouton Creek study sites. The magnitude of toxicity (indicated by the NOEC and median response concentrations) were very different between two samples collected from each site approximately one week apart in June 2000. Samples collected on June 21, 2000 were not toxic, while samples from the June 29, 2000 collection produced strong toxicity in one of the species. Samples collected at Bouton Creek in June 5, 2001 were not toxic, except for *Ceriodaphnia.* The reduced survival and reproduction of the freshwater daphnid can likely be attributed to the higher conductivity of the sample rather than to contaminant toxicity.

A third dry weather site (Cerritos Channel) was sampled for the first time on June 5, 2001. The measured toxicity of the Cerritos sample to daphnids and mysids was similar to that of Belmont and Bouton Creek for the 2001 samples. However, the Cerritos Channel sample seemed to be much more toxic to sea urchins. This latter conclusion on urchin toxicity must be viewed as tentative as the urchin data for this June 2001 sampling are qualified as explained above.

A limited number of samples of dry weather discharge from Los Angeles County have been analyzed using comparable methods. Previous measurements of toxicity to sea urchins are available for the Los Angeles River, San Gabriel River and several smaller creeks and storm drains discharging into Santa Monica Bay (Table 8.6). The sea urchin fertilization results for the Long Beach locations are within the range of these previous measurements. Dry weather flow samples from the Los Angeles and San Gabriel Rivers (wastewater effluent dominated) contained either no or slight toxicity. Toxicity was frequently present in samples from smaller urban discharges into Santa Monica Bay; the fertilization test EC50 in these studies ranged from <6 % to >56 % (Table 8.6). The Santa Monica Bay watershed samples represent predominantly residential sites, which are probably more similar in land use and effluent characteristics to the two Long Beach study sites than are the Los Angeles and San Gabriel River samples.

Table 8.6. Summary of Previous Dry Weather Toxicity Data for Los Angeles County Locations.

Location	Date	Test Type	Samples Tested	Response (% sample) NOEC	EC50
Los Angeles River	1997-98	Sea Urchin Fert.	2	25 - ≥50	>50
San Gabriel River	1997-98	Sea Urchin Fert.	2	≥50	>50
Ballona Creek	1992	Sea Urchin Fert.	3	<6 - ≥56	14 - >56
Ashland Storm Drain	1992	Sea Urchin Fert.	3	<6 – 10	<6 – 17
Pico-Kenter Storm Drain	1992	Sea Urchin Fert.	3	25 - ≥56	41 - >56
Sepulveda Channel	1992	Sea Urchin Fert.	1	10	Na

Variability in the characteristics of toxicity between the Long Beach study sites is indicated by the results for the June 29, 2000 samples. The water flea was the most sensitive species in the Belmont sample test, as indicated by the lower median response value compared to the mysid and sea urchin tests (Table 7.6). In contrast, the sea urchin was the most sensitive species in the Bouton Creek sample test. The presence of a different pattern of relative response among species is an indication that the cause of toxicity in the June 29, 2000 samples was different between sites. The June 5, 2001 samples exhibited little toxicity at either Belmont or Bouton sites.

Differences in the sensitivity of the water flea and sea urchin tests exist for several chemicals and may have contributed to the different patterns of response between sites. For example, the sea urchin test is insensitive to organophosphorus pesticides, while the water flea is among the most sensitive aquatic species known for diazinon toxicity. In contrast, sea urchin fertilization is 10-100 times more sensitive to some trace metals and chlorine than are the mysid and water flea tests. It is premature to speculate on the cause of toxicity in the June 29, 2000 samples because toxicity identification studies have not been conducted.

9.0 CONCLUSIONS

After permits were received, wet weather sampling of storm events began for the City of Long Beach in January, 2001. During this wet weather season, the targeted number of four storm events were monitored at all of the City of Long Beach's mass emission stations, with the exception of the Dominguez Gap Pump Station where only three overflow discharge events occurred during this period. A fifth event was monitored at Los Cerritos Channel as one of the first four events had low storm capture for the composite sample obtained during that event. Four receiving water events were also monitored in Alamitos Bay associated with the above storm events.

Two dry weather inspections/monitoring events were obtained last summer during June, 2000 for the required three mass emission sites and for Alamitos Bay. One similar dry weather event was carried out this year during June 2001 for the four mass emission sites (Los Cerritos added this year) and for the Alamitos Bay receiving water site. These results reported herein. A second dry weather event will be carried out at all of these sites later in the summer (August) and the results reported in an addendum to this report.

A preliminary comparison of combined chemical analytical data from all Long Beach mass emission sites with data from Los Angeles County shows that Mean Event Concentrations (EMCs) for most constituents are generally similar. The frequency and magnitude of storm water toxicity from the Long Beach sites was also similar to toxicity observed in samples from other Southern California watersheds.

Chemical concentrations of contaminants in the mass emission site discharges during storm water events showed concentrations of some metals that exceeded 1997 Ocean Plan daily maximum criteria (Pb, Cu, and Zn) for total metals. Mean EMCs for dissolved Cu exceeded freshwater and salt water California Toxics Rule (CTR) criteria, and the mean EMCs for dissolved Zn exceeded the freshwater CTR criteria. Organic compounds were generally below detection limits in Long Beach storm water discharges. However, limited numbers of occurrences of the pre-emergent herbicide diuron and six other herbicides were measured. The herbicide glyphosate (Trade Name - Round-up) was detected during the April 7th event in water from the Los Cerritos Channel at moderately high levels (94 ug/l) indicating recent applications to control weed growth in that watershed. Three occurrences of both alpha and beta BHC were observed as were occurrences of organophosphate pesticides (diazinon, malathion, and simazine).

Concentrations of bacteria (Total Coliforms, Fecal Coliforms, and Fecal Streptococcus) as measured in the Long Beach mass emission site discharges during storm events were high as is common for all urban runoff.

For the Alamitos Bay receiving water, samples from this study and from the City of Long Beach Department of Health and Human Services monitoring data were compared with historical rainfall records from the Long Beach Airport. Microbiological data from the City's storm water program demonstrate relatively low levels of total coliform, fecal coliform, and fecal streptococcus during all dry weather periods. Tests conducted during wet weather periods resulted in levels of each bacterial component that were one to two orders of magnitude higher than during summer dry weather periods. Based upon all available data, it is not apparent that the dry weather interceptor in Basin 24 has had any discernable impact on the bacterial concentrations in Alamitos Bay during the extended dry weather during the summer of 2000.

Preliminary data also indicate that the Dominguez Gap site was less enhanced with Cu, Pb, and Zn when compared to the other sites. The Dominguez Gap Pump Station has a large detention/infiltration basis just before the pump station that discharges overflow into the Los Angeles River. Los Cerritos Channel generally had the highest TSS and total metal concentrations, though Bouton Creek and the Belmont Pump Station showed higher concentrations of the metals Cu and Zn.

Toxicity characteristics of the wet weather discharges varied among sites. All five samples form the Los Cerritos Channel site caused toxicity to at least two of the species. The Belmont Pump Station had a similar pattern, with three of the four samples being toxic to multiple species. While all four samples from Bouton Creek were toxic, only one species was affected on two occasions. The Dominguez Gap Pump Station was toxic on only two of the three events, and in both cases only toxic to the sea urchin test.

No significant toxicity was present in any of the Alamitos Bay receiving water samples. These results are consistent with three dry weather samples collected from the same site in 2000. Salinity measurements indicated that the wet weather receiving water samples contained about 10 % fresh water. The lack of toxicity in the Alamitos Bay samples is consistent with the results of the wet weather discharge samples, which usually had NOEC values greater than 10%.

TIE investigations on selected storm water samples and the water quality chemistry results showed that trace metals, primarily zinc, was the principal cause of toxicity to sea urchins. There is evidence that other unidentified toxicants are also present in the samples. These other toxicants may include organic compounds.

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